OIPE IAP79 SEP 29 2008 PATENT & TRADEMARK OFFICE

PATENT

Attorney Docket No.: SONY-29200

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Group Art Unit: 2144
Edward Eytchinson et al.	Examiner: Cloud, Joiya M.
Serial No.: 10/763,868	**TRANSMITTAL LETTER**
Filed: January 22, 2004	162 N. Wolfe Road Sunnyvale, CA 94086 (408) 530-9700
For: **METHODS AND APPARATUSES FOR STREAMING CONTENT**	Customer No. 28960

MS: Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Enclosed please find an Appeal Brief to the Notice of Appeal filed July 31, 2008, for filing in the U.S. Patent and Trademark Office. Also enclosed is a check in the amount of $500.00 to cover the appeal brief filing fee.

The Commissioner is hereby authorized to charge any additional fee or credit overpayment to our Deposit Account No. 08-1275.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: September 26, 2008 By: Jonathan O. Owens
Jonathan O. Owens
Reg No.: 37,902

Attorneys for Applicants

CERTIFICATE OF MAILING (37 CFR§ 1.8(a))
I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450

HAVERSTOCK & OWENS LLP.

Date: 9/26/08 By:

OIPE IAP79
SEP 29 2008
PATENT & TRADEMARK OFFICE

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Mail Stop Appeal Brief-Patents
Commissioner for Patents
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Alexandria, VA 22313-1450

Sir:

In furtherance of the Applicants' Notice of Appeal filed on July 31, 2008, this Appeal Brief is submitted. This Appeal Brief is submitted in support of the Applicants' Notice of Appeal, and further pursuant to the rejection mailed on May 1, 2008, in which Claims 1-26 were rejected. The Applicants submit this Appeal Brief to the Board of Patent Appeals and Interferences in compliance with the requirements of 37 C.F.R. § 41.37, as stated in *Rules of Practice Before the Board of Patent Appeals and Interferences (Final Rule)*, 69 Fed. Reg. 49959 (August 12, 2004). The Applicants contend that the rejections of Claims 1-26 in this proceeding are in error, were previously overcome and are overcome again by this appeal.

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I. REAL PARTIES IN INTEREST

As the assignee of the entire right, title, and interest in the above-captioned patent application, the real parties in interest in this appeal, is:

Sony Corporation, a Japanese corporation
6-7-35 Kitashinagawa, Shinagawa
Tokyo, 141
Japan

Sony Electronics Inc., a corporation of the State of Delaware
1 Sony Drive
Park Ridge, NJ 07656-8003

per the assignment document filed on January 22, 2004.

II. RELATED APPEALS AND INTERFERENCES

The Applicants are not aware of any other appeals or interferences related to the present application.

III. STATUS OF THE CLAIMS

Claims 1-27 are involved in the appeal. Claims 1-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publ. No. 2002/0073172 to Armstrong et al. ("Armstrong," a copy of which is attached as Exhibit A) in view of U.S. Patent Publ. No. 2002/0013852 to Janik et al. ("Janik," a copy of which is attached as Exhibit B). Claim 27 has not been addressed by an office action, but for the purposes of this Appeal is presumed to have been rejected based on the same art as applied to Claims 1-26.

IV. STATUS OF THE AMENDMENTS FILED AFTER FINAL REJECTION

No amendments to the claims have been filed after the Office Action mailed on May 1, 2008. Amendments to the specification to correct a typographical error were filed with the response mailed July 31, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention disclosed in the present application number 10/763,868 is directed to methods and apparatuses for streaming content. The content is presented such that a delay time between requesting the content and utilizing the content is minimized. The identity of the user is detected and a preference is identified corresponding to the user. A content item is then selected based on the preference and an initial portion of the content is pre-fetched and stored in a temporary storage cache. When a request is received for the content item, the initial portion is streamed from the temporary storage cache to a stream synchronizer, producing a resultant stream using the initial portion of the content item and seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item.

The elements of Claim 1, directed to one embodiment of the present invention, are described in the Specification at page 20, line 1 through page 22, line 8 and accompanying Figure 7. The method comprises identifying (710, 720) a preference, selecting (740) a content item based on the preference, storing (760) an initial portion of the content item in a temporary storage cache, receiving (740) a request for the content item, streaming (770) the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, producing (770) a resultant stream using the initial portion of the content item and seamlessly transitioning (770) the resultant stream from the initial portion of the content item to an entire segment of the content item.

The elements of Claim 11, directed to one embodiment of the present invention, are described in the Specification at page 8, line 22 through page 11, line 11 and accompanying Figure 3. The system comprises means for identifying (325) a preference, means for selecting (325) a content item based on the preference, means for storing (330) an initial portion of the content item in a temporary storage cache, means for receiving (335) a request for the content item, means for streaming (335) the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, means for producing (340) a resultant stream using the initial portion of the content item and means for seamlessly transitioning (340)

the resultant stream from the initial portion of the content item to an entire segment of the content item.

Means for identifying referred to in the specification as a preference data model (325) is shown in Figure 3. The preference data module (325) contains preferences and usage patterns that are unique to the particular user of the client device (320). [Present Specification, page 9, line 19 through page 10, line 2]

Means for selecting referred to in the specification as a preference data model (325) is shown in Figure 3. The selected audio/visual content is chosen based on the preference data module (325) and the play lists associated with a corresponding user. [Present Specification, page 10, lines 3-12]

Means for storing referred to in the specification as a temporary storage cache (330) is shown in Figure 3. The temporary storage cache (330) is configured to temporarily store an initial portion of selected audio/visual content. [Present Specification, page 10, lines 3-12]

Means for receiving referred to in the specification as a stream buffer (335) is shown in Figure 3. An audio/visual content item is requested by the user. In response to this request, the requested audio/visual content item is streamed through the stream buffer (335) from the media server 310. [Present Specification, page 10, lines 16-20]

Means for streaming referred to in the specification as a stream buffer (335) is shown in Figure 3. The stream buffer (335) serially streams an entire audio/visual content item. In response to this request, the requested audio/visual content item is streamed through the stream buffer 335 from the media server 310. [Present Specification, page 10, lines 16-20]

Means for producing referred to in the specification as a stream synchronizer (340) is shown in Figure 3. The stream synchronizer (340) coordinates the entire stream of audio/visual content from the stream buffer (335) and the initial portion of the audio/visual content from the temporary storage cache (330). [Present Specification, page 10, line 21, lines 16-20]

Means for seamlessly transitioning referred to in the specification as a stream synchronizer (340) is shown in Figure 3. The stream synchronizer (340) seamlessly transitions form the initial portion to the entire stream and simultaneously produces a resultant audio/visual stream that mirrors the entire stream and is without interruptions. [Present Specification, page 11, lines 5-11]

The elements of Claim 12, directed to one embodiment of the present invention, are described in the Specification at page 20, line 1 through page 22, line 8 and accompanying Figure 7. The method comprises storing (760) an initial portion of a selected content item in a

temporary storage cache, streaming (770) the initial portion of the selected content item from the temporary storage cache to a stream synchronizer, simultaneously loading (770) an entire segment of the selected content item to the stream synchronizer while streaming the initial portion, producing (770) a resultant stream comprising the initial portion of the selected content item and seamlessly transitioning (770) the resultant stream from the initial portion of the content item to the entire segment of the content item.

The elements of Claim 19, directed to one embodiment of the present invention, are described in the Specification at page 8, line 22 through page 11, line 11 and accompanying Figure 3. The system comprises means for storing (330) an initial portion of a selected content item in a temporary storage cache, means for streaming (335) the initial portion of the selected content item from the temporary storage cache to a stream synchronizer, means for simultaneously loading (340) an entire segment of the selected content item to the stream synchronizer while streaming the initial portion, means for producing (340) a resultant stream comprising the initial portion of the selected content item and means for seamlessly transitioning (340) the resultant stream from the initial portion of the content item to the entire segment of the content item.

Means for storing referred to in the specification as a temporary storage cache (330) is shown in Figure 3. The temporary storage cache (330) is configured to temporarily store an initial portion of selected audio/visual content. [Present Specification, page 10, lines 3-12]

Means for streaming referred to in the specification as a stream buffer (335) is shown in Figure 3. The stream buffer (335) serially streams an entire audio/visual content item. In response to this request, the requested audio/visual content item is streamed through the stream buffer 335 from the media server 310. [Present Specification, page 10, lines 16-20]

Means for simultaneously loading referred to in the specification as a stream synchronizer (340) is shown in Figure 3. The stream synchronizer (340) simultaneously produces a resultant audio/visual stream that mirrors the entire stream and is without interruptions. [Present Specification, page 11, lines 5-11]

Means for producing referred to in the specification as a stream synchronizer (340) is shown in Figure 3. The stream synchronizer (340) coordinates the entire stream of audio/visual content from the stream buffer (335) and the initial portion of the audio/visual content from the temporary storage cache (330). [Present Specification, page 10, line 21, lines 16-20]

Means for seamlessly transitioning referred to in the specification as a stream synchronizer (340) is shown in Figure 3. The stream synchronizer (340) seamlessly transitions

form the initial portion to the entire stream and simultaneously produces a resultant audio/visual stream that mirrors the entire stream and is without interruptions. [Present Specification, page 11, lines 5-11]

The elements of Claim 20, directed to one embodiment of the present invention, are described in the Specification at page 8, line 22 through page 11, line 11 and accompanying Figure 3. The system comprises a media server (310) configured for storing an entire segment of content, a client device (320) configured for storing an initial portion of the content wherein the client device is configured to display the content by streaming a resultant stream from the initial portion of the content while simultaneously receiving the entire segment of the content and seamlessly substituting the entire segment of the content for the initial portion.

The elements of Claim 27, directed to one embodiment of the present invention, are described in the Specification at page 16, line 17 through page 17, line 3; page 20, line 1 through page 22, line 8 and accompanying Figures 5 and 7. The method comprises identifying (710, 720) a preference, selecting (740) a content item based on the preference, prefetching (710,720) an initial portion of the content item, storing (760) the initial portion of the content item in a temporary storage cache, (740) receiving a request for the content item, streaming (770) the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, producing (770) a resultant stream using the initial portion of the content item, and seamlessly transitioning (770) the resultant stream from the initial portion of the content item to an entire segment of the content item.

VI. GROUNDS OF REJECTION AND OTHER MATTERS TO BE REVIEWED ON APPEAL

The following issues are presented in this Appeal Brief for review by the Board of Patent Appeals and Interferences:

1. Whether Claims 1-27 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Armstrong in view of Janik.

VII. ARGUMENT

Grounds for Rejection

Within the Office Action, Claims 1-27 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Armstrong in view of Janik.

Outline of Arguments

In the discussion that follows, the Applicants discuss the teachings of Armstrong, the teachings of Janik and the teachings of the combination of Armstrong and Janik. As will be discussed in detail below, the combination of Armstrong and Janik does not teach storing an initial portion of a content item in a temporary storage cache. Armstrong, Janik and their combination also do not teach selecting and storing a content item based on an identified preference. Armstrong, Janik and their combination also do not teach prefetching an initial portion of the content item.

1. Armstrong does not teach storing an initial portion of a content item in a temporary storage cache. Armstrong also does not teach selecting and storing a content item based on an identified preference. Armstrong also does not teach prefetching an initial portion of the content item.

Armstrong teaches a method and apparatus for storing content within a video on demand environment. [Armstrong, Abstract] An information server stores at least a portion of content and communicates with a secondary storage module to retrieve at least the remaining portion of the requested content. [Armstrong, ¶ 0018, Figure 1] The information server comprises a plurality of server modules. Each of the server modules is coupled to a respective disk array functioning as a primary storage module. [Armstrong, ¶ 0024, Figure 2] Each server module retrieves information from its respective disk array for each subscriber supported, and transfers the retrieved information to the respective buffer. The switch accesses each buffer in a round robin fashion to produce an output stream comprising the multiplexed contents of each of the buffers. [Armstrong, ¶ 0040] Armstrong does not teach storing an initial portion of the content item in a temporary storage cache. The Applicants respectfully submit that a cache is physically different from a disk array. Although, as stated within page 7 of the Office Action, a disk array "has cache memory," a disk array is a disk storage system which contains multiple disk drives. (See http://en.wikipedia.org/wiki/Disk_array) A disk drive is a *peripheral* device used to collect information from. (See http://en.wikipedia.org/wiki/Disk_drive) In contrast, a cache is a block of memory for temporary storage of data likely to be used again. As such, the disk array of Armstrong is not a temporary storage cache. Armstrong also does not teach selecting and storing

a content item based on an identified preference. Janik is cited for this reason. Armstrong also does not teach prefetching an initial portion of the content item.

2. Janik does not teach storing an initial portion of a content item in a temporary storage cache. Janik also does not teach prefetching an initial portion of the content item. Janik aslo does not teach identifying a preference and selecting a content item based on the preference where the content is streamed.

Janik teaches a system for providing content, management, and interactivity for thin client devices. Janik teaches a capability for determining and aggregating the content objects presented to a specific user on content selection web pages which is derived from content preference selections provided by the user. [Janik, ¶ 0082] Content from the Internet or otherwise digital content is accessed and cached locally in a server. The cached content is sent to thin client devices. [Janik, ¶ 0027] Janik teaches retaining user preference information for the purpose of customizing web portal content according to the user preferences, and has nothing to do with identifying a preference and selecting content based on the preference where the content is streamed. Janik further teaches time-based automation of the accessing, caching and streaming of content from the Internet at times prescribed by the user or at times derived by direction given by the user through the GUI content editors. [Janik, ¶ 0105]

Janik teaches that there are three functional modes including setup, real-time user controlled content/data delivery and automatic content/data delivery. [Janik, ¶ 0129] Janik further teaches that

> [i]n automatic mode, content 10 that the user has selected for playback in the content editor is sent automatically to the playback device, based on some prescribed time setting that was pre-set by the user. A scheduling function in core module 42 compares time inputs listed in system control application database 96 with the current state of PC 34 system timer. When a match occurs between a time input in system control application database 96 and the current state of PC 34 system timer, core module 42 initiates the delivery of content 10 to client device 78. [Janik, ¶ 0165]

Accordingly, Janik teaches automatically obtaining content based on a time schedule. Janik does not teach *prefetching* content based on a preference corresponding to a user. Janik also does not teach storing an initial portion of a content item in a temporary storage cache. Accordingly, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item

in a temporary storage cache. Similarly, Armstrong, Janik and their combination do not teach prefetching content based on a preference corresponding to a user. Armstrong, Janik and their combination also do not teach identifying a preference and selecting a content item based on the preference where the content is streamed.

3. The combination of Armstrong and Janik is improper. Even if considered proper, the combination of Armstrong and Janik does not teach storing an initial portion of a content item in a temporary storage cache. The combination of Armstrong and Janik does not teach prefetching content based on a preference corresponding to a user. The combination of Armstrong and Janik also does not teach identifying a preference and selecting a content item based on the preference where the content is streamed.

This is a classic case of impermissibly using hindsight to make a rejection based on obviousness. The Court of Appeals for the Federal Circuit has stated that "it is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In Re Fritch, 972 F.2d, 1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). As recognized within the Office Action, Armstrong does not teach identifying a preference and selecting a content item based on the preference. Janik only teaches retaining user preference information for the purpose of customizing web portal content according to the user's preferences and does not teach preferences related to streaming content. Within the Office Action, it is stated that:

> ...it would have been obvious to one of ordinary skill in the networking art at the time of the invention was made to have incorporate Amstrongs's teachings to the teachings of Janik, for the purpose of providing a means to allow the user to receive specific requests based on their preference and furthermore for returning to a user a desired stream to "meet user expectations" **(Armstrong: paragraph [0006]**. [Office Action, Page 3]

It is only with the benefit of the present claims, as a "template" that there is any motivation to combine the method and apparatus for storing content within a video on demand environment of Armstrong with the web portal content editor aspects of Janik.

The cited paragraph of Armstrong, Paragraph 06, is focused on user expectations in terms of image/sound quality and system latency and has nothing to motivate one to identify a preference and select a content item based on the preference. The user expectations of better image/sound quality and shorter system latency are qualities that any user would prefer, but they are not preferences that a user would have the opportunity to identify and then select content based on the preference. Furthermore, the user preference information for customizing web portal content as described in Janik is completely unrelated to identifying a preference and selecting a content item based on the preference where the content item is streamed. To conclude that the combination of Armstrong and Janik is obvious, based on the teachings of these references, is to use hindsight based on the teachings of the present invention and to read much more into Armstrong and Janik than their actual teachings. This is simply not permissible based on the directive from the Court of Appeals for the Federal Circuit.

It is well settled that to establish a *prima facie* case of obviousness, three basic criteria must be met:

1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
2) there must be a reasonable expectation of success; and
3) the prior art reference, or references, must teach or suggest all the claim limitations. MPEP § 2143.

The burden of establishing a *prima facie* case of obviousness based on the teachings of Armstrong and Janik has not been met within the Office Action.

There is no motivation to combine the teachings of Armstrong with Janik. Armstrong teaches a method and apparatus for storing content within a video on demand environment. Janik teaches a system for providing content, management and interactivity for thin client devices, but the cited section of Janik is focused on a web portal content editor. As described above, the method and apparatus for strong content within a video on demand environment of Armstrong is completely unrelated to the web portal content editor of Janik.

For clarification, Armstrong teaches:

> A method and apparatus for maximizing the number of content titles available within a video on demand system by storing an initial portion of each title on a primary storage device and a remaining portion of each title on a secondary storage device, wherein the secondary storage device is used to provision the

> primary storage device in response to a subscriber request for a title having an initial portion stored on the primary storage device. [Armstrong, Abstract]

Thus, it is clear that Armstrong is directed to a video on demand system and storing the content in a specified fashion.

Unrelated, the cited sections of Janik teach:

"[a] means for retaining user preference information for the *purpose of customizing the web portal content* according to the users preferences." [Janik, ¶80] (emphasis added)

> The capability for determining and aggregating the *content objects 20 presented to a specific user on content selection web pages 22 are derived from content preferences selections provided by the user*. For example, referring now to FIG. 22 a content preference selection web page 24 is shown with content selection check boxes 42 beside content selection labels 46 that describe a variety of content choices. The *user uses the mouse to click on the boxes next to desired content types*, as shown in FIG. 22. Thereafter *upon returning to content selection web page 22, only content objects 20 that relate to the selected content types are displayed to the user*. Functionally, content selection labels 46 are graphical representations of HTML links to actual content files, such as digital audio or digital video files. These links are organized and stored in a content link database 126 on content link database server 130. The actual content files to which content selection labels 46 refer are stored at the content creator's or content aggregator's servers. [Janik, ¶82] (emphasis added)

Thus, it is clear that Janik teaches an implementation of modifying a web page based on content preference selections. The mere fact that Janik teaches "preferences" and "content selection" is not sufficient to automatically combine Armstrong and Janik. Although similar words or phrases are used within the claimed invention, Janik is completely unrelated to the claimed invention. As described above and shown herein, there is no hint, teaching or suggestion in either Armstrong or Janik to motivate one skilled in the art to combine their teachings. It is only with the benefit of the presently claimed invention as a "template" that one would consider combining the video on demand system of Armstrong with the web page editor of Janik.

The MPEP also states, "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, 270 F.2d 810, 123 (CCPA 1959); MPEP §2143.01. Since the proposed combination of Armstrong and Janik would completely change Armstrong from a video on demand system to a

video on demand system with a web page editor, the principle of operation would be completely changed. Thus, for yet another reason, the combination of Armstrong and Janik is improper.

Even if considered proper, Armstrong, Janik and their combination do not teach storing an initial portion of a content item in a temporary storage cache. Armstrong, Janik and their combination do not teach prefetching content based on a preference corresponding to a user. Armstrong, Janik and their combination also do not teach identifying a preference and selecting a content item based on the preference where the content is streamed.

In contrast to Armstrong, Janik and their combination, the present invention is directed to methods and apparatuses for streaming content. The content is presented such that a delay time between requesting the content and utilizing the content is minimized. The identity of the user is detected and a preference is identified corresponding to the user. A content item is then selected based on the preference and an initial portion of the content is pre-fetched and stored in a temporary storage cache. When a request is received for the content item, the initial portion is streamed from the temporary storage cache to a stream synchronizer, producing a resultant stream using the initial portion of the content item and seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item. As described above, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item in a temporary storage cache.

4. The claims distinguish over Armstrong, Janik and their combination.

The claims are grouped separately below to indicate that they do not stand or fall together.

a. Claims 1-10

The independent Claim 1 is directed to a method comprising identifying a preference, selecting a content item based on the preference, storing an initial portion of the content item in a temporary storage cache, receiving a request for the content item, streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, producing a resultant stream using the initial portion of the content item and seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item. As described above, the combination of Armstrong and Janik is improper.

Even if considered proper, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item in a temporary storage cache. Additionally, Armstrong, Janik and their combination also do not teach identifying a preference and selecting a content item based on the preference. For at least these reasons, the independent Claim 1 is allowable over the teachings of Armstrong, Janik and their combination.

Claims 2-10 are all dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over the teachings of Armstrong, Janik and their combination. Accordingly, the Claims 2-10 are all also allowable as being dependent upon an allowable base claim.

Additionally, the dependent Claim 3 includes the limitation wherein the preference includes a playlist. Paragraph 44 of Armstrong is cited as teaching this limitation. However, Paragraph 44 of Armstrong does not teach a playlist. Paragraph 44 of Armstrong teaches each content stream comprises a play track and other tracks, but this is not a playlist. Furthermore, since it is admitted in the Office Action that Armstrong does not teach identifying a preference and selecting a content item based on the preference, it is inherently impossible for Armstrong to teach wherein the preference includes a playlist. For at least these additional reasons, the dependent Claim 3 is allowable over the teachings of Armstrong, Janik and their combination.

Additionally, the dependent Claim 5 includes the limitation of identifying a user associated with the preference. Paragraphs 80 and 82 of Janik are cited as teaching this limitation. However, Paragraphs 80 and 82 of Janik do not teach identifying a user associated with the preference. Paragraphs 80 and 82 of Janik use the phrase "user preference," but do not identify a user associated with the preference. Examples of ways of identifying users include using a password, a personal identification number or a biometric parameter. [Present Specification, page 20, lines 3-5] For at least these additional reasons, the dependent Claim 5 is allowable over the teachings of Armstrong, Janik and their combination.

b. Claim 11

The independent Claim 11 is directed to a system comprising means for identifying a preference, means for selecting a content item based on the preference, means for storing an initial portion of the content item in a temporary storage cache, means for receiving a request for the content item, means for streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, means for producing a resultant

stream using the initial portion of the content item and means for seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item. As described above, the combination of Armstrong and Janik is improper. Even if considered proper, neither Armstrong, Janik nor their combination teach means for storing an initial portion of a content item in a temporary storage cache. Additionally, Armstrong, Janik and their combination also do not teach means for identifying a preference and means for selecting a content item based on the preference. For at least these reasons, the independent Claim 11 is allowable over the teachings of Armstrong, Janik and their combination.

c. Claims 12-18

The independent Claim 12 is directed to a method comprising storing an initial portion of a selected content item in a temporary storage cache, streaming the initial portion of the selected content item from the temporary storage cache to a stream synchronizer, simultaneously loading an entire segment of the selected content item to the stream synchronizer while streaming the initial portion, producing a resultant stream comprising the initial portion of the selected content item and seamlessly transitioning the resultant stream from the initial portion of the content item to the entire segment of the content item. As described above, the combination of Armstrong and Janik is improper. Even if considered proper, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item in a temporary storage cache. For at least these reasons, the independent Claim 12 is allowable over the teachings of Armstrong, Janik and their combination.

Claims 13-18 are all dependent upon the independent Claim 12. As discussed above, the independent Claim 12 is allowable over the teachings of Armstrong, Janik and their combination. Accordingly, the Claims 13-18 are all also allowable as being dependent upon an allowable base claim.

d. Claim 19

The independent Claim 19 is directed to a system comprising means for storing an initial portion of a selected content item in a temporary storage cache, means for streaming the initial portion of the selected content item from the temporary storage cache to a stream synchronizer, means for simultaneously loading an entire segment of the selected content item to the stream

synchronizer while streaming the initial portion, means for producing a resultant stream comprising the initial portion of the selected content item and means for seamlessly transitioning the resultant stream from the initial portion of the content item to the entire segment of the content item. As described above, the combination of Armstrong and Janik is improper. Even if considered proper, neither Armstrong, Janik nor their combination teach means for storing an initial portion of a content item in a temporary storage cache. For at least these reasons, the independent Claim 19 is allowable over the teachings of Armstrong, Janik and their combination.

e. Claims 20-26

The independent Claim 20 is directed to a system comprising a media server configured for storing an entire segment of content, a client device configured for storing an initial portion of the content wherein the client device is configured to display the content by streaming a resultant stream from the initial portion of the content while simultaneously receiving the entire segment of the content and seamlessly substituting the entire segment of the content for the initial portion. As described above, the combination of Armstrong and Janik is improper. Even if considered proper, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item on a client device. For at least these reasons, the independent Claim 20 is allowable over the teachings of Armstrong, Janik and their combination.

Claims 21-26 are all dependent upon the independent Claim 20. As discussed above, the independent Claim 20 is allowable over the teachings of Armstrong, Janik and their combination. Accordingly, the Claims 21-26 are all also allowable as being dependent upon an allowable base claim.

f. Claim 27

The independent claim 27 is directed to a method comprising identifying a preference, selecting a content item based on the preference, prefetching an initial portion of the content item, storing the initial portion of the content item in a temporary storage cache, receiving a request for the content item, streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request, producing a resultant stream using the initial portion of the content item, and seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item. As described

above, the combination of Armstrong and Janik is improper. Even if considered proper, neither Armstrong, Janik nor their combination teach prefetching an initial portion of the content item. As also described above, neither Armstrong, Janik nor their combination teach storing an initial portion of a content item on a client device. For at least these reasons, the independent Claim 27 is allowable over the teachings of Armstrong, Janik and their combination.

4. CONCLUSION

For the above reasons, it is respectfully submitted that the Claims 1-27 are allowable over the cited prior art references. Therefore, a favorable indication is respectfully requested.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: September 26, 2008

By: _____
Jonathan O. Owens
Reg. No.: 37,902
Attorney for Applicant

CERTIFICATE OF MAILING (37 CFR§ 1.8(a))
I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450

HAVERSTOCK & OWENS LLP.

Date: 9/30/08 **By:** _____

VIII. CLAIMS APPENDIX

This appendix includes a list of the claims under appeal.

1. A method comprising:
identifying a preference;
selecting a content item based on the preference;
storing an initial portion of the content item in a temporary storage cache;
receiving a request for the content item;
streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request;
producing a resultant stream using the initial portion of the content item; and
seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item.

2. The method according to claim 1, wherein the preference is associated with a user.

3. The method according to claim 1, wherein the preference includes a playlist.

4. The method according to claim 1, wherein the resultant stream mirrors the entire segment of the content.

5. The method according to claim 1, further comprising identifying a user associated with the preference.

6. The method according to claim 1, wherein the content includes one of a document, an image, audio data, and video data.

7. The method according to claim 1, further comprising transmitting the entire segment of the content to a stream buffer in response to the request.

8. The method according to claim 7, wherein the transmitting the entire segment of the content occurs simultaneously with streaming the initial portion.

9. The method according to claim 1, wherein the seamlessly transitioning occurs in real-time.

10. The method according to claim 1, further comprising presenting the resultant stream beginning with the initial portion and subsequently followed by a portion of the entire segment.

11. A system comprising:

means for identifying a preference;

means for selecting a content item based on the preference;

means for storing an initial portion of the content item in a temporary storage cache;

means for receiving a request for the content item;

means for streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request;

means for producing a resultant stream using the initial portion of the content item; and

means for seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item.

12. A method comprising:

storing an initial portion of a selected content item in a temporary storage cache;

streaming the initial portion of the selected content item from the temporary storage cache to a stream synchronizer;

simultaneously loading an entire segment of the selected content item to the stream synchronizer while streaming the initial portion;

producing a resultant stream comprising the initial portion of the selected content item; and

seamlessly transitioning the resultant stream from the initial portion of the content item to the entire segment of the content item.

13. The method according to claim 12, further comprising identifying a preference.

14. The method according to claim 13, wherein the content is selected from a plurality of content in response, in part, to the preference.

15. The method according to claim 12, wherein the transitioning occurs in real-time.

16. The method according to claim 12, further comprising requesting the content.

17. The method according to claim 12, wherein the content includes one of a document, an image, audio data, and video data.

18. The method according to claim 12, further comprising displaying the resultant stream.

19. A system comprising:

means for storing an initial portion of a selected content item in a temporary storage cache;

means for streaming the initial portion of the selected content item from the temporary storage cache to a stream synchronizer;

means for simultaneously loading an entire segment of the selected content item to the stream synchronizer while streaming the initial portion;

means for producing a resultant stream comprising the initial portion of the selected content item; and

means for seamlessly transitioning the resultant stream from the initial portion of the content item to the entire segment of the content item.

20. A system comprising:

a media server configured for storing an entire segment of content;

a client device configured for storing an initial portion of the content wherein the client device is configured to display the content by streaming a resultant stream from the initial portion of the content while simultaneously receiving the entire segment of the content and seamlessly substituting the entire segment of the content for the initial portion.

21. The system according to claim 20, wherein the client device is configured to store the initial portion of the content prior to a request for the content.

22. The system according to claim 20, wherein the client device is configured to receive the entire segment subsequent to a request for the content.

23. The system according to claim 20, wherein the client device further comprises a preference data module configured for storing information relating to the content.

24. The system according to claim 20, wherein the client device further comprises a temporary storage cache configured for storing the initial portion of the content.

25. The system according to claim 20, wherein the client device further comprises a stream buffer configured for receiving the entire segment of the content.

26. The system according to claim 20, wherein the content includes one of a document, an image, audio data, and video data.

27. A method comprising:

identifying a preference;

selecting a content item based on the preference;

prefetching an initial portion of the content item;

storing the initial portion of the content item in a temporary storage cache;

receiving a request for the content item;

streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request;

producing a resultant stream using the initial portion of the content item; and

seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item.

IX. EVIDENCE APPENDIX

STATEMENT

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), the following is a statement setting forth where in the record the evidence of this appendix was entered by the examiner:

Evidence Description:	**Where Entered:**
U.S. Pat. Publ. No. 2002/0073172	Office Action mailed October 18, 2007
U.S. Pat. Publ. No. 2002/0013852	Office Action mailed October 18, 2007
Office Action May 1, 2008	Examiner Office Action

X. RELATED PROCEEDINGS APPENDIX

There are no related proceedings.

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(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2002/0073172 A1**

Armstrong et al. (43) **Pub. Date: Jun. 13, 2002**

(54) **METHOD AND APPARATUS FOR STORING CONTENT WITHIN A VIDEO ON DEMAND ENVIRONMENT**

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(21) Appl. No.: **09/733,407**

(22) Filed: **Dec. 8, 2000**

Related U.S. Application Data

(63) Non-provisional of provisional application No. 60/170,138, filed on Dec. 10, 1999.

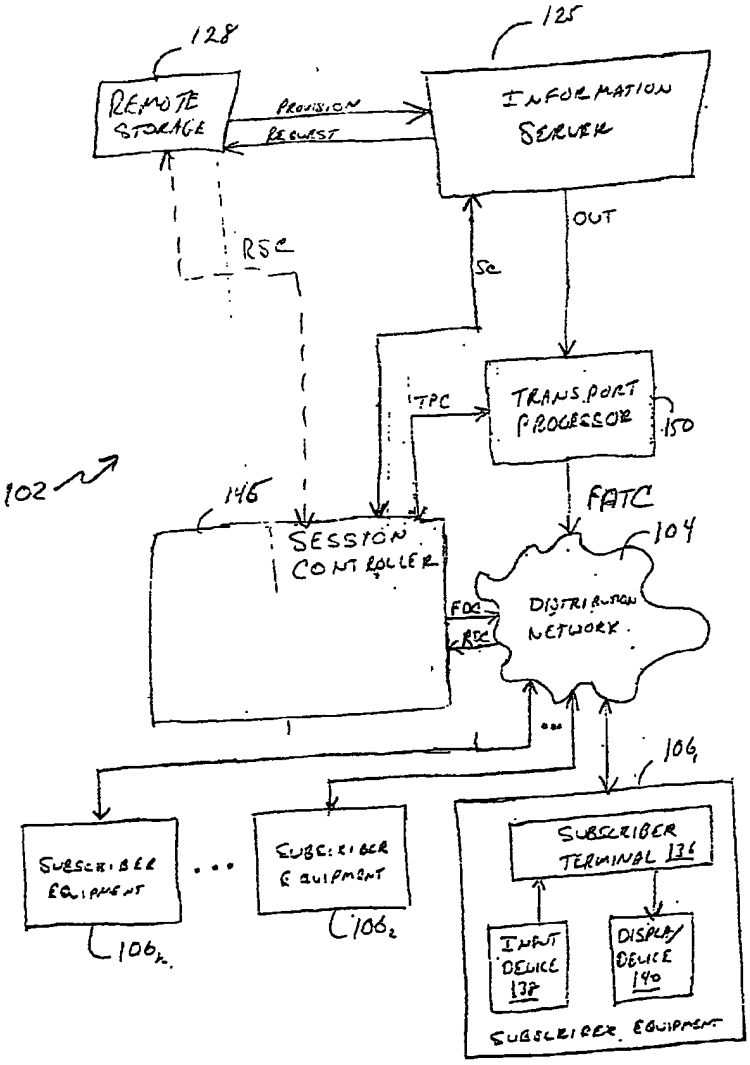
Publication Classification

(51) **Int. Cl.**[7] **G06F 15/173**; G06F 15/16

(52) **U.S. Cl.** **709/219**; 709/225

(57) **ABSTRACT**

A method and apparatus for maximizing the number of content titles available within a video on demand system by storing an initial portion of each title on a primary storage device and a remaining portion of each title on a secondary storage device, wherein the secondary storage device is used to provision the primary storage device in response to a subscriber request for a title having an initial portion stored on the primary storage device.



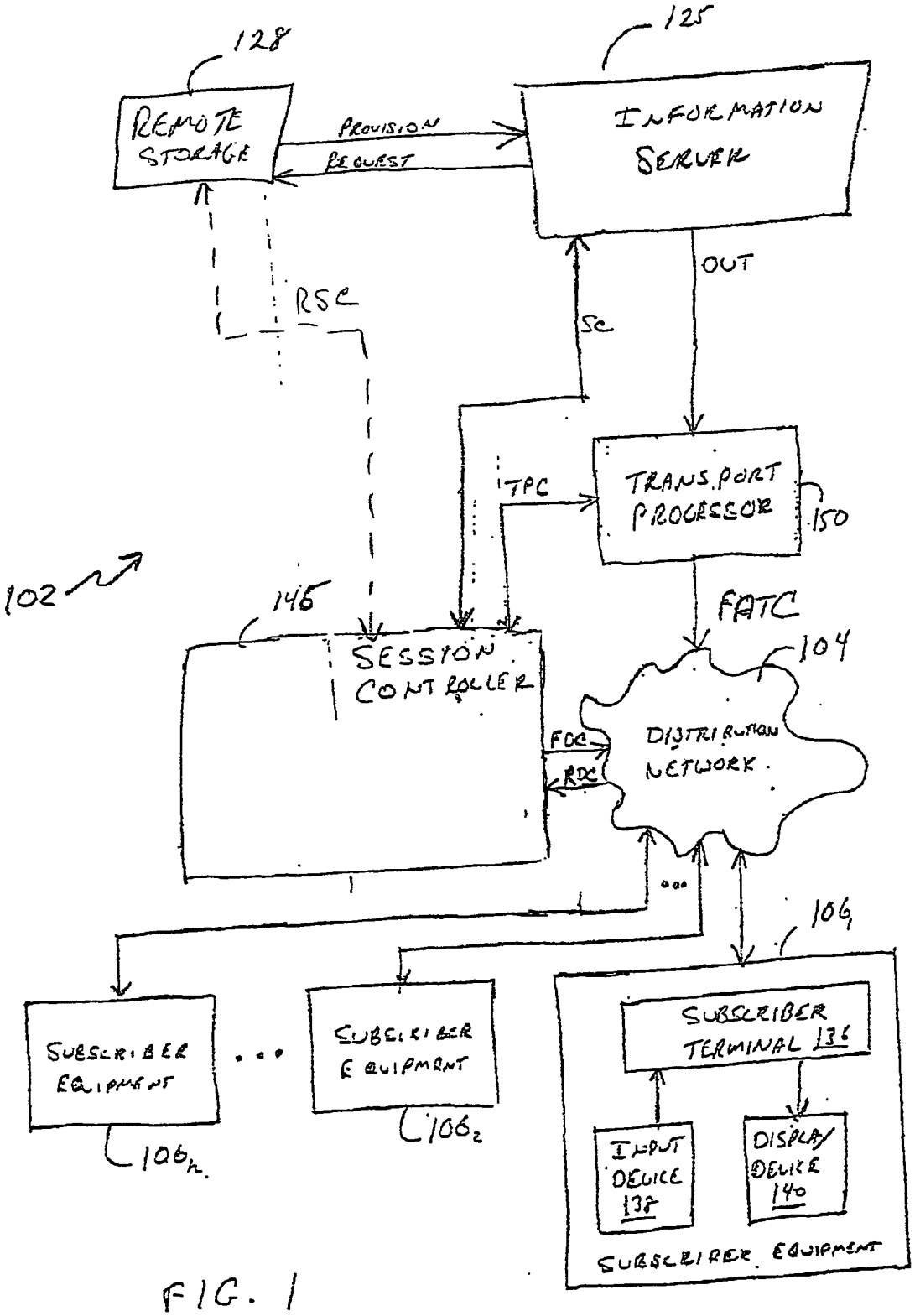

128
125
REMOTE STORAGE
PROVISION
REQUEST
INFORMATION SERVER
RSC
SC
OUT
TPC
TRANSPORT PROCESSOR
150
102
146
SESSION CONTROLLER
FATC
104
FDC
RDC
DISTRIBUTION NETWORK
106
SUBSCRIBER EQUIPMENT
106h
SUBSCRIBER EQUIPMENT
1062
SUBSCRIBER TERMINAL 136
INPUT DEVICE 138
DISPLAY DEVICE 140
SUBSCRIBER EQUIPMENT

FIG. 1

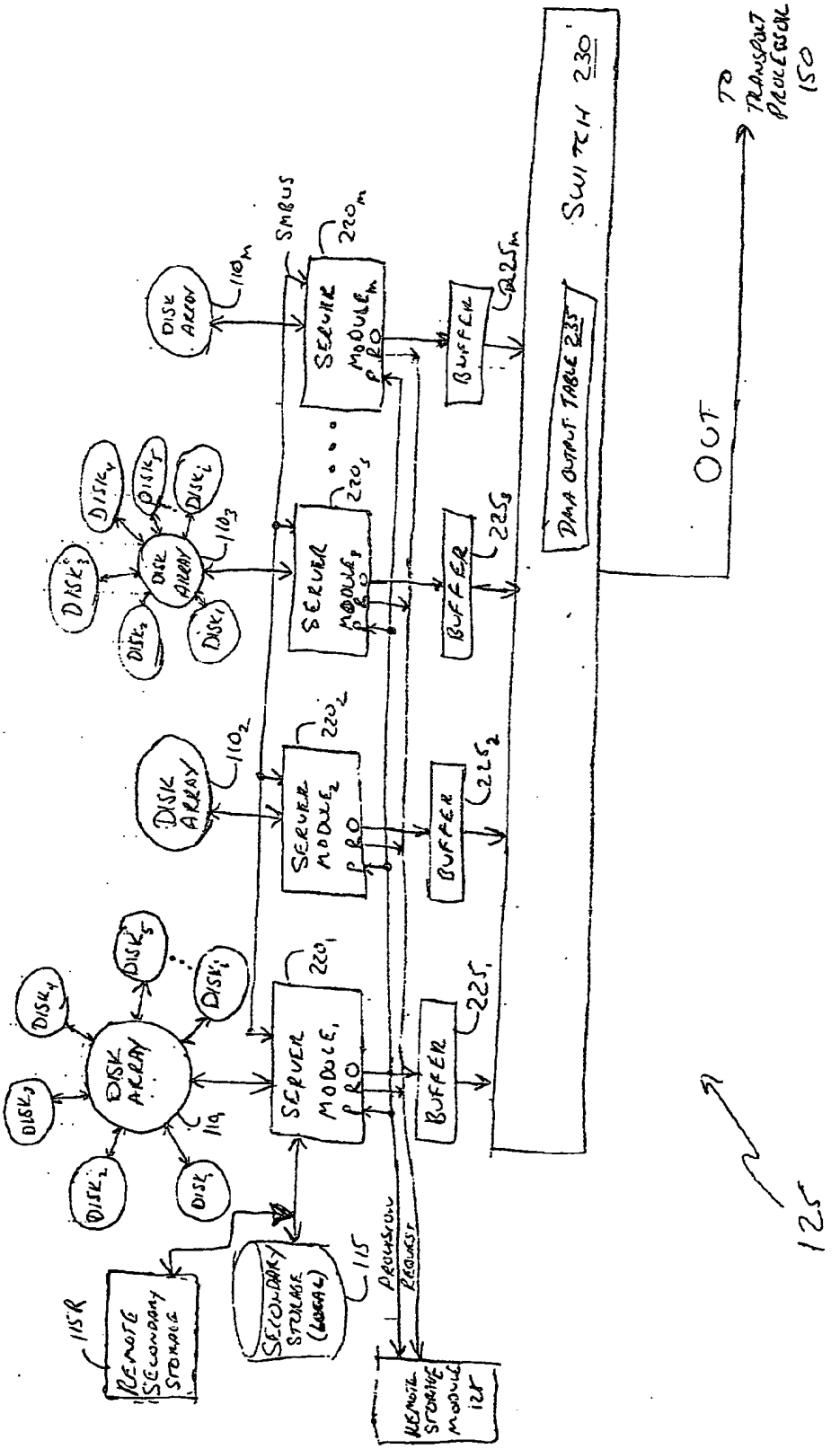

DISK ARRAY
DISK 1
DISK 2
DISK 3
DISK 4
DISK 5
110
SERVER MODULE PRO
220
BUFFER
225
SWITCH 230
DMA OUTPUT TABLE 235
OUT
TO TRANSPORT PROCESSOR 150
SECONDARY STORAGE (LOCAL)
115
REMOTE SECONDARY STORAGE
115R
REMOTE STORAGE MODULE 125
ARCHIVE REQUEST
125

FIG. 2

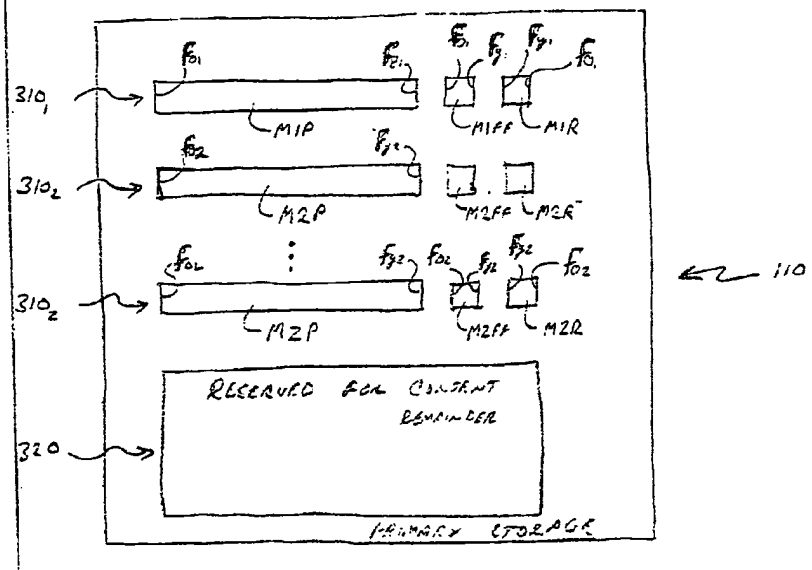
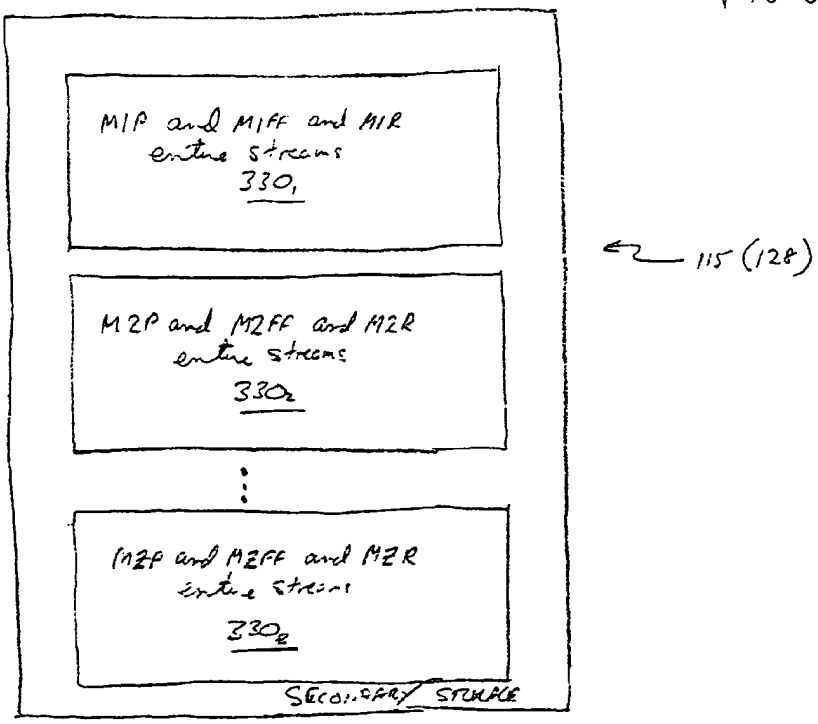

310₁
M1P
M1FF
M1R
310₂
M2P
M2FF
M2R
310₂
M2P
M2FF
M2R
110
320
RESERVED FOR CONTENT REMAINDER
PRIMARY STORAGE

FIG 3


M1P and M1FF and M1R entire streams
330₁
M2P and M2FF and M2R entire streams
330₂
M2P and M2FF and M2R entire streams
330₂
SECONDARY STORAGE
115 (128)

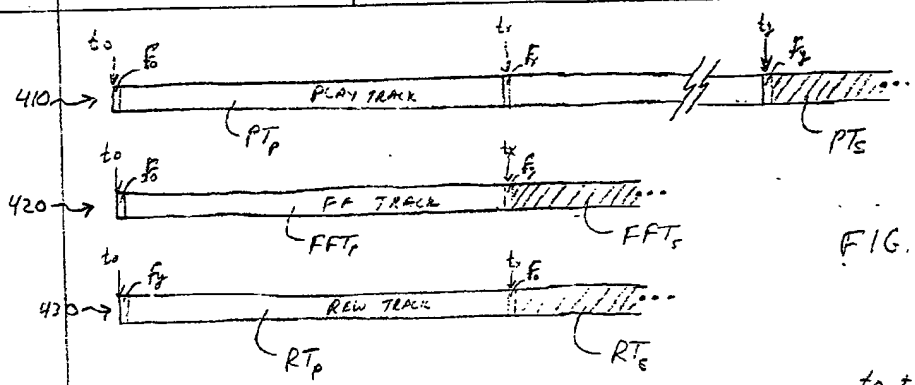


FIG. 4

ASSUME STORAGE OF 20 MINUTES OF PLAY TRACK ($t_y = 20$ minutes) ON PRIMARY STORAGE, $\therefore t_x = \frac{t_y}{\text{FF/REW RATE}}$

t_0 = time at start of each track on PRIMARY STORAGE

t_x = time at end of FF track and REW track on PRIMARY STORAGE

t_y = time at end of PLAY track on PRIMARY STORAGE

IF FF/REW rate $\approx 9 *$ PLAY RATE, then $t_y = 9 * t_x$

f_0 = first frame in PLAY TRACK on PRIMARY STORAGE
f_y = last frame in PLAY TRACK on PRIMARY STORAGE

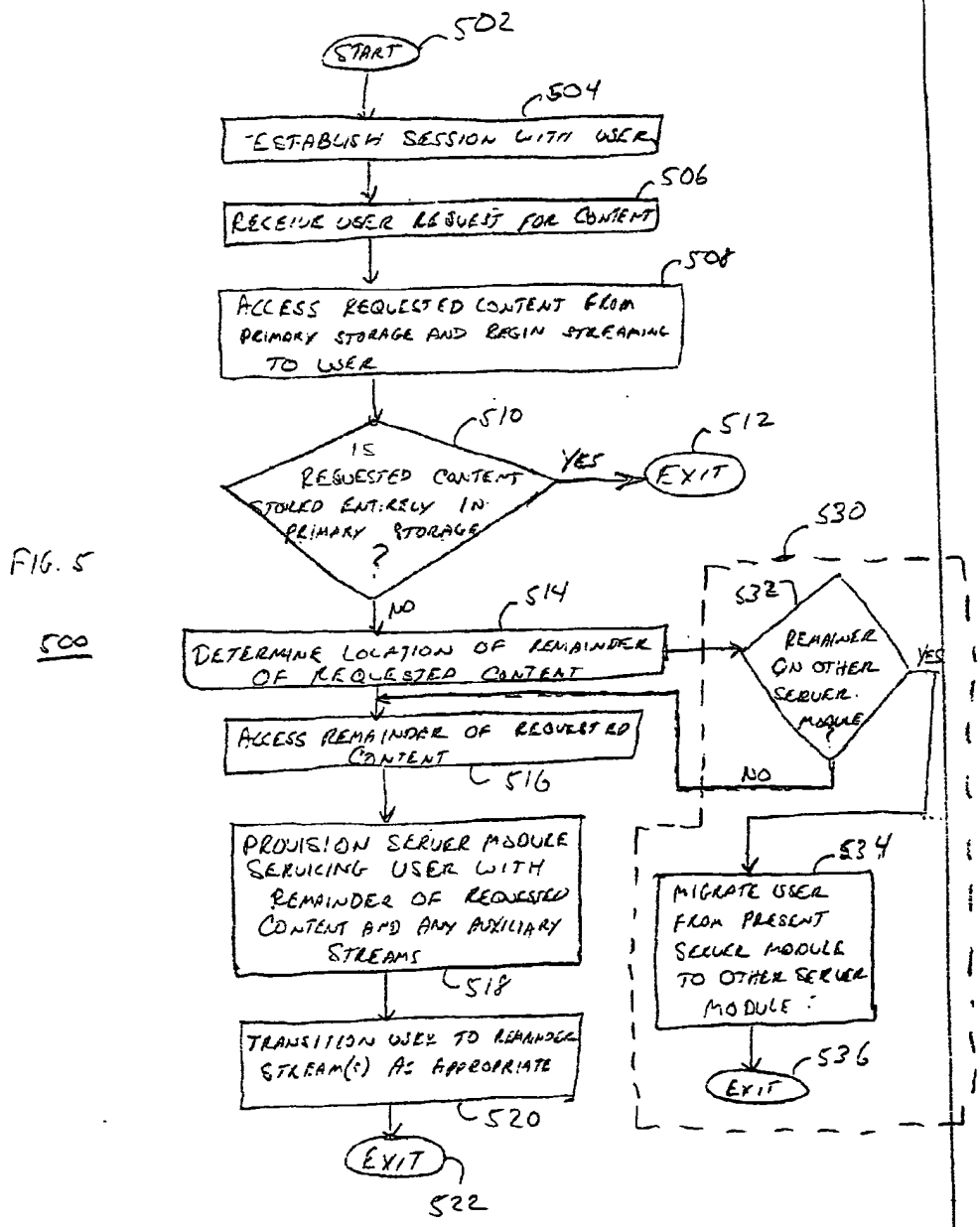

START
502
ESTABLISH SESSION WITH USER
504
RECEIVE USER REQUEST FOR CONTENT
506
ACCESS REQUESTED CONTENT FROM PRIMARY STORAGE AND BEGIN STREAMING TO USER
508
IS REQUESTED CONTENT STORED ENTIRELY IN PRIMARY STORAGE ?
510
YES
EXIT
512
NO
DETERMINE LOCATION OF REMAINDER OF REQUESTED CONTENT
514
ACCESS REMAINDER OF REQUESTED CONTENT
516
PROVISION SERVER MODULE SERVICING USER WITH REMAINDER OF REQUESTED CONTENT AND ANY AUXILIARY STREAMS
518
TRANSITION USER TO REMAINDER STREAM(S) AS APPROPRIATE
520
EXIT
522
530
532
REMAINER ON OTHER SERVER MODULE ?
YES
NO
534
MIGRATE USER FROM PRESENT SERVER MODULE TO OTHER SERVER MODULE
536
EXIT

FIG. 5

500

METHOD AND APPARATUS FOR STORING CONTENT WITHIN A VIDEO ON DEMAND ENVIRONMENT

CROSS REFERENCE

[0001] This application claims benefit of United States Provisional Application No. 60/170,138, filed Dec. 10, 1999, which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an information distribution system such as a video-on-demand (VOD) system. More particularly, the present invention relates to a method and apparatus for efficiently utilizing "on line" and "near line" storage media to provide increased availability of content streams to users.

[0004] 2. Description of the Background Art

[0005] VOD systems providing content encoded according to the various Moving Pictures Experts Group (MPEG) standards are known. For example, a first standard known as MPEG-1 refers to ISO/IEC standards 11172, which is incorporated herein by reference in its entirety. A second standard known as MPEG-2 refers to ISO/IEC standards 13818, which is incorporated herein by reference in its entirety. Additionally, a compressed digital video system is described in the Advanced Television Systems Committee (ATSC) digital television standard document A/53, incorporated herein by reference.

[0006] The most important characteristic of a video on demand system is the experience of a user receiving content via that system. That is, a user ideally selects desired content and the system provides the desired content to the user in a timely manner and at a quality level consistent with the user's expectations. Failure to meet the user expectations in terms of image quality, sound quality, system latency or other factors results in a less than satisfying experience to the user.

[0007] In the case of a video on demand system utilizing a plurality of servers to provide content to users, it is seen to be desirable to sense anomalous conditions or other errors within a server presently providing content to a user and, upon determination that an error exists, migrating that user to a server not affected by the error condition. More specifically, it is seen to be desirable to provide a method and apparatus for migrating users between information server modules in a manner minimizing disruption of content streams being provided to the user.

SUMMARY OF THE INVENTION

[0008] The disadvantages heretofore associated with the prior art are overcome by the present invention of a method and apparatus for maximizing the number of content titles available within a video on demand system by storing an initial portion of each title on the primary storage device and a remaining portion of each title on a secondary storage device, wherein said secondary storage device is used to provision said primary storage device upon request of said content stream stored on said primary storage device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The teachings of the present invention can be readily understood by considering the following detailed description in conjunction with the accompanying drawings, in which:

[0010] **FIG. 1** depicts a high level block diagram of an interactive information distribution system;

[0011] **FIG. 2** depicts a block diagram of an information server suitable for use in the interactive information distribution system of **FIG. 1**;

[0012] **FIG. 3** depicts a graphical diagram useful in understanding the present invention;

[0013] **FIG. 4** depicts a graphical diagram useful in understanding the present invention; and

[0014] **FIG. 5** depicts a flow diagram of a method according to the present invention and suitable for use in the interactive information distribution system of **FIG. 1**

[0015] To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures.

DETAILED DESCRIPTION

[0016] **FIG. 1** depicts a high level block diagram of an interactive information distribution system. Specifically, **FIG. 1** depicts a high level block diagram of an interactive information distribution system **100** containing the present invention. The system **100** contains service provider equipment **102**, a communications network **104** and subscriber equipment **106*n***, where n is an integer greater than zero.

[0017] The service provider equipment **102** comprises an information server **125**, a session controller **145**, a transport processor **150** and, optionally, a remote storage module **128**. Briefly, the session controller **145**, in response to a request(s) from subscriber equipment **106**, causes the requested content to be retrieved from the information server **125** and provided to the transport processor **150**. The transport processor **150** combines or multiplexes the retrieved content to provide an output data stream for the requesting subscriber(s). The output data stream is conditioned for transport to the requested subscriber via a forward application transport channel (FATC) within the distribution network **104**.

[0018] The information server **125** is used to store at least a portion of content such as movies, television programs and other information offerings of the interactive information distribution system **100** of **FIG. 1**. Additionally, the information server **125** is used to store assets such as bit map imagery, graphic overlay, control scripts and the like. The assets may comprise, for example, navigation assets that are used by a set top terminal to interactively navigate, and select for viewing, the offerings or content available from the service provider equipment **102**. The information server **125**, in response to a control SC produced by the session controller **145**, provides content and/or asset data to the transport processor **150**. In the case of the information server **125** storing only a portion of content requested by a user, the information server **125** communicates with a secondary storage module, such as remote storage module **128**, to retrieve at least the remaining portion of the requested content. In this manner, the information server **125** may be

used to store only a portion of each of a plurality of content streams (such as movies) available to users. This aspect of the system **100** of **FIG. 1** will be described in more detail below with respect to FIGS. **2-5**. The information server will be described in more detail below with respect to **FIG. 2**.

[0019] The session controller **145** provides session control of the information flowing to and from the information server **125**, and may be generally described as a system providing or controlling communications between, for example, a cable system head-end and one or more set top terminals **136** The session controller **145** produces the storage control signal SC for controlling and communicating with the information server **125**, and a transport processor control signal TPC for controlling and communicating with the transport processor **150**. In response to a user request for particular content, the session controller **145** causes the requested content file and to be streamed from the information server **125** to the transport processor **150**. The session controller **145** optionally produces a remote storage control signal RSC for controlling and communicating with the remote storage module **128**. Remote storage control signal RSC is used to cause remote storage module **128** to begin the process of retrieving a remaining portion of a content stream requested by a user, where an initial portion of that content stream is stored within a primary storage device in the information server **125**. In this manner, the provisioning of the primary server with the requested content may be more rapidly accomplished.

[0020] The session controller **145** sends data, such as commands, encryption keys and the like, to set top terminals via a forward data channel (FDC). The session controller **145** receives data, such as information stream requests and session initiation data (set top identification, capability and the like) via a reverse data channel (RDC). The FDC and RDC are supported by the distribution network **104** and comprise relatively low bandwidth data channels, such as one-two megabits per second data channels utilizing QPSK, QAM, or other modulation techniques. The FDC and RDC are also known as "out-of-band" channels, while the relatively high bandwidth forward application transport channel (FATC) is also known as an "in-band" channel. The session controller **145** contains an interface device for sending control information via the forward data channel FDC and receiving control information and request information via the reverse data channel RDC using the so-called "out-of-band" carrier frequencies.

[0021] The transport processor **150** accomplishes all of the forward content channel transmission interface requirements of the system **100** of **FIG. 1**. Specifically, the transport processor **150** is coupled to subscriber equipment via the forward applications transport channel (FATC). That is, the transport processor **150** is capable of providing a plurality of scrambled or unscrambled content and/or asset streams modulated onto various carrier frequencies suitable for use in the distribution network **104**. The FATC is supported by the distribution network **104** and comprises a relatively high bandwidth communications channel well suited to carrying video, audio and data such as, for example, multiplexed MPEG-2 transport packets. It should be noted that data normally conveyed to a set top terminal via the FDC may be included in the FATC data stream. The transport processor **150** also contains a modulator for modulating the combined content and asset stream onto one or more carrier frequencies for transmission on the FATC, the so-called "in-band" carrier frequencies.

[0022] The distribution network **104** can be any one of a number of conventional broadband communications networks that are available such as a fiber optic network, a telephone network, a cable television network and the like. For example, if the network is a hybrid fiber-coax network, the transmission transport technique used in both forward channels may be modeled after the Moving Pictures Expert Group (MPEG) transport protocol for the transmission of video data streams. In general, the transport mechanism for both of the forward channels that transport information to the set top terminal must be able to carry unidirectional, asynchronous packetized data such as that defined in the MPEG video and audio signal transmission protocol, and the like. There are a number of such transport protocols available.

[0023] The subscriber equipment **106** comprises a set top terminal or a set top box **136**, a display device **140** (e.g. a conventional television) and a user input device **138** (e.g. a remote control device). Each set top terminal **136** receives the data streams from the FATC, demodulates the received data streams and, in the case of video streams, processes the demodulated video streams for subsequent display on the display device **140**. In the case of receiving scrambled data streams, the STT descrambles the received data streams using the descrambling messages DM provided to the STT via the FATC or the FDC. The STT uses the authorization messages AM provided via the FATC or FDC to determine if a descrambling of the received scrambled stream is authorized. In addition, the set top terminal **136** accepts commands from the remote control input device **138** or other input device. These commands are formatted, modulated, and transmitted through the distribution network **104** to the session controller **145**. Typically, this transmission is accomplished through the reverse data channel RDC. These commands are preferably transmitted through the same network used to transmit information to the set top terminal. However, the RDC coupling the set top terminal to the provider equipment **102** may be a separate network, e.g. a FATC through a television cable network and an RDC through a telephone network. The telephone network could also support the FDC.

[0024] **FIG. 2** depicts a block diagram of an information server suitable for use in the interactive information distribution system **100** of **FIG. 1**. Specifically, the information server **125** of **FIG. 2** comprises a plurality of server modules 220_1-220_m, where m is an integer (collectively service modules **220**). Each of the server modules **220** is coupled to a respective disk array **110** functioning as a primary storage module. Each of the respective disk arrays **110** comprises, illustratively, a plurality of disks, such as optical or magnetic storage disks capable of providing an appropriately high throughput. It will be noted in **FIG. 2** that the first disk array 110_1, which is coupled to the first server module (220_1) comprises a plurality of disks denoted as $DISK_1$ through $DISK_i$, where i is an integer. Similarly, disk array 110_3, which is coupled to server module 220_3 comprises a plurality of disks denoted as $DISK_1$ through $DISK_i$. To simplify **FIG. 2**, disks forming the disk arrays 110_2, 110_4 and 110_m of the remaining server modules **2** and **4** through m are not shown.

[0025] It will be appreciated by those skilled in the art that each server module **220** may be associated with more than one disk arrays **110**. Moreover, the disk arrays **110** coupled to the server modules **220** may comprise high speed disk arrays suitable for providing primary or "on line" storage and/or lower speed disk arrays suitable for providing secondary or "near line" storage. In this context, primary storage media is defined as storage media capable of streaming (i.e., accessing and providing data to the buffer during the appropriate extent deadline) content in real time to a user within the system. By contrast, secondary storage is defined as media that typically does not stream real time content to users. Secondary storage comprises, illustratively, magneto optical disk drives, tape drives, and other media which provide relatively low cost storage of content and/or asset data, though typically at the expense of increased latency. It will be appreciated that while secondary storage is typically defined as non-realtime capable, that consideration is strictly a matter of system architecture selection. Since the cost of mass storage devices is decreasing dramatically while the capability of such devices is increasing dramatically, present mass storage technology is capable of providing inexpensive, realtime content streaming functionality.

[0026] Storage devices may be segmented into a plurality of groups; namely, on line, off line, and near line. On line storage units, such as primary storage units comprising disk drive arrays and other high speed storage units are suitable for providing streamed content directly to users. Off line storage devices are most suitable for archival purposes (e.g., tape drives and other sequential access devices). Near line storage devices, such as magneto-optical disks and other relatively slow mass storage devices, are capable of provisioning on line devices in a sufficiently rapid manner (i.e., provisioning a primary device in a timely manner such that a content stream provided to a user is maintained).

[0027] For purposes of simplification, it is assumed that the disk arrays **110** of **FIG. 2** are primary storage media. Within the system **100** of **FIG. 1**, such primary storage media typically store at least an initial portion of a core group of the content and/or asset data available from the information provider equipment **102**. However, in the case of a user requiring non-primary content, such as an old movie or some other content and/or asset data deemed ill suited for primary storage, the server module **220** supporting that particular user will have to move the desired content from the appropriate secondary storage module (e.g., a tape drive) to the primary storage module (e.g., a disk array). As will be discussed in detail below, the present invention enables the storage of initial portions of a very large subset (or all) of the available content on primary storage media.

[0028] As noted in **FIG. 2**, a local secondary storage module **115** is associated with the first server module 220_1. It will be appreciated by those skilled in the art that the local secondary storage module **115** may be associated with each of the server modules **220** within the information server **125** of **FIG. 2**. Moreover, each of the server modules **220** may be associated with a plurality of secondary storage modules (not shown) such that the server modules **220** are respectively associated with "shared" and "non-shared" local secondary storage modules.

[0029] In one embodiment of the invention, one or more of the server modules **220** of the information server **125** are operably coupled to the remote storage module **128** depicted in **FIG. 1**. The remote storage module **128** may comprise any high capacity storage module suitable for storing either the remainder portion of content streams or entire content streams. Additionally, remote storage module **128** (as with the local secondary storage modules **115**) is used to store the play stream, fast forward stream, rewind stream, associated audio streams, and any other streams related to the content. Alternatively, a remote secondary storage module **115R** is depicted as cooperating with the server modules **220** (illustratively, server module 220_1) to provide secondary storage functionality.

[0030] It is noted that the remote secondary storage module **115R** and/or the remote storage module **128** may be coupled to the server modules **220** via a high speed network such as an optical network, the internet, a satellite network and the like. All that is required is that the appropriate content stream or content stream portion to be served to a user is accessible in a timely manner and that the network communicating the content or content portion from the remote secondary storage **115R** or remote storage module **128R** includes sufficient bandwidth. It is also noted that the secondary storage devices **115**, **115R** and the remote storage module **128** may store portions or entireties of content streams.

[0031] In one embodiment of the invention, a primary storage device includes only an initial portion of a content stream to be provided to a user. In response to the user selecting the content stream, a secondary storage device is immediately utilized to provision the primary storage device with the remaining portion of the content stream. Thus, the primary storage device is used to store the entirety of a content stream requested by a user, and such provisioning of the primary storage device is effected upon, for example, a user request for the content stream.

[0032] In alternate embodiments of the invention, the secondary storage device streams the remaining portion of content to the requesting user while, optionally, provisioning the primary storage device with the remaining portion of the content stream. In this manner, multiple users requesting the same content stream may be satisfied via a single access of the secondary storage device.

[0033] In the case where the primary storage device is provisioned by the secondary storage device, the primary storage device may be used to stream the remaining portion of content after such provisioning. In this example, the initial portion of a content stream requested by a user is provided by a primary storage device, a first portion of the remaining portion is then provided by the secondary storage device which also contemporaneously provisions the primary storage device with the remaining portion of the content stream. Upon completion of the provisioning of the primary storage device, the primary storage device is again used to provide the content stream directly to the user. Thus, transitions in servicing the user are made from the primary storage device to the secondary storage device at the end of the stored initial portion of the content, and from the secondary storage device to the primary storage device after provisioning of the primary storage device. Such transition may be effected by migrating users between primary and secondary storage devices/servers.

[0034] An information server **125** suitable for use in the present invention is described by Chin et al. in U.S. Pat. No.

5,579,527 and incorporated herein by reference in its entirety. A system for supplying streams to multiple users suitable for use in the present invention is described by Bleidt et al. in U.S. Pat. No. 5,671,377 and incorporated herein by reference in its entirety. It must be noted that while the invention may advantageously utilize a massively parallel storage, retrieval and distribution system, the invention does not require the use of such a system. Rather, the invention is well suited to any storage arrangement in which the user is receiving data from a plurality of server modules storing similar data are migrated between the server modules.

[0035] A method and apparatus for minimizing disk drive access time in, e.g., a disk drive array and suitable for use in the present invention is described by Armstrong in commonly assigned U.S. patent application Ser. No. 08/818,172 (Attorney Docket No. 533/11635), filed on Mar. 14, 1997 and incorporated herein by reference in its entirety.

[0036] Each server module **220** (within the information server **125**) is associated with a respective buffer **225**. Each buffer memory is capable of holding at least one service period (i.e., one extent) worth of information retrieved from a disk array **110** via the respective server module **220**. Each buffer **225** is coupled to a switch **230**.

[0037] The switch **230** operates to multiplex the contents of each buffer **225** in a round robin fashion to produce an output stream OUT that is coupled to the transport processor **150** for subsequent transport to the appropriate subscribers **106** via the forward application transport channel (FATC) supported by the distribution network **140**. The exemplary embodiment uses a service period of two seconds. Thus, each extent retrieved from a single disk within a disk array **210** comprises two seconds worth of information, illustratively, video information and associated audio information. Thus, in the case of 30 frames per second video, each buffer **225** must hold at least 60 frames of video and any associated audio information. The output stream OUT is modulated by modulation circuitry within the transport processor **150** and transmitted to the appropriate subscribers.

[0038] In one embodiment of the invention, each of the output buffers **225** supporting the server modules **220** comprise respective portions of a common memory module. That is, each of the server modules **220** stores data to a respective portion of a common memory module. In this embodiment of the invention, the switch **230** utilizes a direct memory access (DMA) output link table **235** to access the appropriate portions of the common buffer memory to retrieve the contents of each of the output buffers **225**.

[0039] Each server module **220** is capable of providing information to a plurality of users **106**. Thus, each buffer **225** associated with a server module **220** is capable of holding at least one extent of data for each of the plurality of subscribers **106** serviced by that server module **220**. For example, if the first server module (220_1) is capable of serving **100** subscribers, then the buffer 225_1 associated with the first server module 220_1 must be capable of holding at least 200 seconds worth of information, illustratively video information and any associated audio information.

[0040] Under normal operating circumstances, each server module **220** retrieves information from its respective disk array (primary storage) for each subscriber **106** supported, and transfers the retrieved information to the respective buffer (or buffer region) **225**. The switch **230** accesses each buffer **225** in a round robin fashion to produce an output stream OUT comprising the multiplexed contents of each of the buffers 225_1 to 225_m. In the case of only a portion of each available information stream being stored in a respective disk array, the stored portion is transferred to the respective buffer **220** while at the same time the remaining portion is retrieved from a secondary storage unit, such as local secondary storage module **115** or remote secondary storage module **128**.

[0041] In the case of a server module failure, a primary or secondary storage failure such as a disk array failure, a buffer failure, or some other event affecting the flow of information to subscribers via one of the server modules **220**, the users on the affected server module **220** is migrated to another server module. Since the information server **125** comprises a plurality of server modules **220**, the loss of one or more server modules **220** may be compensated for by migrating some or all of the users from the damaged server module(s) to the remaining, functional server modules. In this manner, component failures within the information server **125** will result in a degradation of information server performance that, ideally, will not adversely impact the experience of users receiving content streams within the information distribution system **100** of **FIG. 1**.

[0042] Advantageously, a user may also be migrated to another server module if the other server module includes, in a respective primary storage module, the entire content stream requested by that user. Specifically, assume that a first server module is servicing a user that has requested a particular content stream. If the particular content stream is only partially stored in the primary storage associated with the first server module, then the remaining portion of the requested content must be retrieved from a secondary storage module. However, if another server module includes the entirety of the requested content within its primary storage, then the user may be migrated to the second server module. In this manner, the user content request may be satisfied without resorting to secondary storage access. Apparatus and method for effecting a user migration between server modules is described in more detail in commonly assigned U.S. patent application Ser. No. _____, filed on (Attorney Docket No. 533/241), which is incorporated herein by reference in its entirety.

[0043] To accomplish such migration of users between server modules **220**, and to determine if requested content is available on other server modules **220**, the server modules **220** communicate with each other via a service module bus SMBUS to determine if such a migration is possible or useful.

[0044] **FIG. 3** depicts a graphical diagram useful in understanding the present invention. Specifically, **FIG. 3** depicts a graphical representation of content stored by a primary storage module and a secondary storage module according to one aspect of the invention. Specifically, a primary storage module, such as the disk array **110**, is used to store only a portion of each of a plurality of content streams. Each content stream comprises at least a play track and, optionally, a fast forward track and rewind track. A play track comprises a normal speed track. A fast forward track comprises a temporally decimated version of a play track which,

when played by the subscriber equipment **106**, results in a fast forward or "special play" presentation of the content on the user's presentation device. A rewind track comprises a temporally decimated version of a play track which has been reversed in order (e.g., a frame-reversed FF track) such that, when played by a user, results in a rewind or "reverse play" presentation of the content. It should be noted that fast forward and rewind tracks may be created to impart any desired increase in apparent play rate. However, in keeping with the traditional fast forward/rewind rates of standard analog video cassette recorders (VCRs), the exemplary embodiment uses fast forward rewind tracks having a presentation rate of between seven and nine times the presentation rate of the play track.

[0045] Referring to the primary storage **110** depicted in **FIG. 3**, a plurality of content streams M1-MZ (**310**$_1$-**310**z) are depicted as being represented by respective initial play (P), fast forward (FF) and rewind (R) portions. Each of the respective initial portions of the content streams M1-MZ (**310**$_1$-**310**$_z$) is sufficient to provide an initial presentation of, for example, 20 minutes to a requesting user. Additionally, a portion **320** of primary storage is reserved for the remainder of content being streamed to a requesting user. Specifically, a reserved portion **320** of primary storage is used to store the remainder portion of content stream(s) requested by user(s) within the system.

[0046] Referring to the secondary storage **115/128** depicted in **FIG. 3**, a plurality of at least remaining portions of the content streams M1-MZ (**330**$_1$-**330**$_z$) are depicted as being stored therein. For example, in the case of a user requesting a first content stream M1 (**310**$_1$), the play track of the first content stream M1P is streamed to the requesting user. The remaining portion of the first content stream M1 is retrieved from the secondary storage module such as local secondary storage module **115** or remote secondary storage module **128** and stored in the reserved portion **320** of the primary storage module **110** for subsequent streaming to the requesting user. It is important to store at least some of the remaining portion of the requested content in reserved portion **320** prior to the presentation of the terminating image frame F_{Y1}. In this manner, the stream provided to the user may be changed from the initial content stream **310** to a remaining content stream **320** in a relatively seamless manner.

[0047] Referring to **FIG. 3**, a primary storage module (illustratively a disk array **110**) is depicted as storing respective initial portions of each of a plurality of content streams (denoted as M1 through MZ while a secondary storage module (illustratively a magneto-optical or tape drive) is depicted as storing respective remaining portions of the plurality of content streams). While the following discussion is primarily directed to a first content stream M1, it will be understood that the discussion is equally applicable to the other content streams M2-MZ.

[0048] Specifically, a portion of a first content stream M1 is stored as a play track portion M1P, a fast forward track portion M1FF and a rewind track portion M1R. The play track portion M1P comprises all frames between a first image frame F_{01} and a terminating image frame F_{Y1}. The first image frame F_{01} comprises the first image frame of the content stream M1. The terminating image frame F_{Y1} comprises the last image frame of the initial portion of the content stream M1 stored in the primary storage device. For purposes of this discussion, it will be assumed that a 20 minute portion of each content stream M1-MZ is stored in the primary storage device. Therefore, assuming a frame rate of 30 frames per second, the terminating image frame F_{Y1} is approximately the 36,000th frame of the first content stream M1.

[0049] The fast forward track portion M1FF of the content stream M1 comprises that portion of the fast forward track including the first image frame F_{01} and the terminating image frame F_{Y1}. Similarly, the portion of the rewind track M1R of the content stream M1 comprises that portion of the rewind track including the terminating image frame F_{Y1} and the first image frame F_{01}. In the embodiment of the invention depicted in **FIG. 3**, the rewind track M1R of the content stream M1 comprises, essentially, a reversed frame order version of the fast forward track M1FF of the content stream M1. However, as will be discussed in more detail below, the fast forward and rewind tracks do not need to be of the same length, nor must they be inclusive of the same content. However, to simply the discussion of the present invention, the fast forward and rewind tracks are made symmetrical as shown in **FIG. 3**.

[0050] Thus, an initial (e.g., 20 minutes) portion of a first content stream M1 is represented by those portions of a corresponding play track M1P, fast forward track M1FF and rewind track M1R bounded by an initial image frame F_{01} and a terminating image frame F_{Y1}. Though not shown, it will be appreciated by those skilled in the art that at least the audio portion associated with the play track M1P is also stored in the primary storage device and presented with the play track. In addition to the audio portion, meta-data and other auxiliary data related to the content stream may also be stored on the primary storage device for utilization within the presentation of the content by a user.

[0051] In one embodiment of the invention, the fast forward track M1FF and rewind track M1R associated with the content stream do not include all of the corresponding frames associated with the entire play track M1P. Specifically, since the major use for a fast forward track, at least at the beginning of a content stream, is fast forwarding through introductory materials, trailers, credits and other content other than the feature presentation of the content stream, such non-feature presentation content is included within the fast forward track M1FF. In this manner, the storage of fast forward (and, optionally, rewind) track information associated with feature presentation is avoided.

[0052] Referring to **FIG. 3**, it is noted that the secondary storage module is depicted as including the entire play, fast forward, and rewind tracks for each of a plurality of content streams denoted as M1-MZ (**330**$_1$-**330**$_z$). Specifically, the entire play track M1P, fast forward track M1FF and rewind track M1R of the entire content stream M1 is depicted as being stored in a memory region **330**$_1$ of the secondary storage module. Similarly, the entire play track, fast forward track and rewind track of content streams 2-Z are depicted as being stored in respective regions **330**$_2$-**330**. However, in another embodiment of the invention, only the remaining portion of the content stream is stored in the secondary storage module. That is, the primary storage module **110** is used to store only the initial portion, while the secondary storage module is used to store only he remaining.

[0053] **FIG. 4** depicts a graphical diagram useful in understanding the present invention. Specifically, **FIG. 4** depicts a graphical representation of the play track **410**, fast forward track **420** and rewind track **430** of a content stream.

[0054] A first or initial portion PT_P of the play track is stored on a primary storage module, while at least a remaining portion PT_S of the play track **410** is stored on a secondary storage module. A first or initial portion FFT_P of the fast forward track **420** is stored on the primary storage module, while a remaining portion FFT_S of the fast forward track is stored on the secondary storage module. A first or initial portion RT_P of the rewind track **430** is stored on a primary storage module, while a remaining portion RT_S of the rewind track **430** is stored on a secondary storage module.

[0055] It is assumed that the portion PT_P of the play track **410** stored on the primary storage module comprises a 20 minute play track. Referring to **FIG. 4**, the portion PT_P of the play track stored on the primary storage module begins at a time to with an initial image frame F_0, and terminates at a time t_Y with a terminating image frame F_Y. Each of the fast forward track portion FFT_P and rewind track portion RT_P begin at time to and terminate at a time t_X. The fast forward track portion FFT_P begins with an image frame F_0 and terminates with an image frame F_Y. By contrast, the rewind track portion RT_P begins with an image frame F_Y and terminates at the image frame F_0.

[0056] The time t_0 is the time at the start of each track stored in the primary storage module. The time t_Y is equal to the time at which the play track portion PT_P ends. The time t_X is the time at which the fast forward track portion FFT_P and rewind track portion RT_P ends. The time t_X is related to t_Y by the fast forward/rewind rate of the fast forward track **420** and rewind track **430**. For example, if the FF/REW rate is equal to approximately nine times the play rate, then t_Y is equal to approximately nine times t_X. Therefore, if t_Y is determined to be 20 minutes, then t_X is equal to approximately 2.22 minutes.

[0057] **FIG. 5** depicts a flow diagram of a method according to the present invention and suitable for use in the system of **FIG. 1**. Specifically, **FIG. 5** depicts a flow diagram of a method **500** for satisfying user requests for content within the context of a system in which content is only partially stored in a primary storage module (as described above with respect to **FIGS. 2, 3** and **4**).

[0058] The method **500** is entered at step **502** and proceeds to step **504**, where a session with a user is established. That is, the server controller **145** sets up the physical channel and logical channel for providing content in the user via the FATC. In addition, Navigation assets and other data are provided to the user. The method **500** then proceeds to step **506**, where a user request for content is received, and to step **508**.

[0059] At step **508** the requested content is accessed from the primary storage module and is streamed to the requesting user. That is, at step **508** the portion of the requested content stored in the primary storage module associated with the server module servicing the user is accessed and coupled to the transport processor **150**. The transport processor **150** begins providing the content to the user via the forward applications transport channel (FATC) on the physical and local channel defined by the session controller **145** and communicated to the requesting user during session establishment at step **504**. The method **500** then proceeds to step **510**.

[0060] At step **510** a query is made as to whether the requested content is stored entirely in primary storage. That is, a query is made as to whether the particular server module **220** providing content to the requesting user is associated with a primary storage module (such as disk array **110**) that includes the requested content and any auxiliary streams (e.g., fast forward and rewind streams) in their entirety. If the query at step **510** is answered affirmatively, then the method proceeds to step **512** where it is exited. In this case, the content is retrieved from primary storage in the normal manner and provided to the requesting user. If the query at step **510** is answered negatively, then the method **500** proceeds to step **514**.

[0061] At step **514** the location of the remainder of the requested content is determined. That is, at step **514** it is determined whether the remaining portion of the content (play, fast forward, rewind, audio and other tracks) associated with the requested content is stored on a local secondary storage device **115** or the remote secondary storage device **128**. The method **500** then proceeds to **516**.

[0062] At step **516** the remainder of the requested content is accessed from the secondary storage device determined in step **514**. The method **500** then proceeds to step **518**, where the server module **220** servicing the requesting user is provisioned with the remainder of the requested content and any auxiliary streams. That is, at step **518** the remaining portion of the requested content is stored in a primary storage device associated with the server module servicing the requesting user.

[0063] It should be noted that, as previously discussed, a secondary storage device is (typically) unable to provide real time streaming of content to a user, while a primary storage device is capable of providing real time streaming of content to a user. Thus, it is likely that the newly provisioned content on the primary storage device will begin streaming to the requesting user prior to the conclusion of the provisioning process.

[0064] Most important is that the user's experience is not significantly degraded or interrupted. Thus, as long as the secondary storage unit (**115** or **128**) provisions the primary storage unit (display **110**) at a sufficiently high rate such that the transport processor **150** is able to continuously provide play, fast forward, rewind and other tracks to the user, then the system is working effectively. The method **500** then proceeds to step **520**.

[0065] At step **520** the requesting user is transitioned to the newly provisioned remainder stream(s) as appropriate. That is, at step **520** a transition is made in the content stream supplied to the requesting user from the initial content stored on the primary storage device to the remaining content that has been provisioned onto the primary storage device. In the case of a second primary storage device including the requested content, the first primary storage device is not provisioned. Rather, the user stream is retrieved from the second primary storage device.

[0066] With the above-described method **500**, the user receives a requested content stream without any visual or aural artifacts, while the provider **102** efficiently utilizes

primary storage in a manner making a large number of titles available to each user. Such efficient storage utilization helps drive down system costs and improve system reliability. The method **500** then proceeds to step **522** where it is exited.

[0067] Optionally, after determining the location of the remainder of the content requested by the user at step **514**, the above method **500** proceeds to step **530**. At step **530** a determination is made (step **532**) as to whether the remaining content is located on a primary storage module associated with another server module **220** within the information server **125**. That is, at step **532** a determination is made as to whether another server module has associated with it a primary storage device including the content requested by the user. If the query at step **532** is answered negatively, then the method **500** proceeds to step **516**. If the query at step **532** is answered affirmatively, then the method **500** proceeds to step **534**.

[0068] At step **534** the user is migrated from the present server module to the other server module. That is, since another server module includes, in a respective primary storage means, the content requested by the user, that requesting user is migrated over to the other circuit module. Apparatus and method for effecting this migration between server modules is described in more detail in commonly assigned U.S. patent application Ser. No. _____, filed on _____ which is incorporated herein by reference in its entirety.

[0069] After migrating the requesting user from the present server module to the server module including the requested content stored in the respective primary storage means, the method **500** proceeds to step **536** where it is exited.

[0070] In the exemplary embodiments of the invention discussed above, the illustrative portion of the play track stored within the primary storage is approximately 20 minutes. The 20 minute storage amount is determined with respect to the speed of the secondary storage devices and the possible use of a fast forward by a user to quickly traverse the entire initial content portion. For example, in the interactive information distribution system **100** of **FIG. 1**, a user requesting a content stream will begin to receive the content stream from the primary storage. If the user immediately depresses a "fast forward" key on an input device **138**, then the set top terminal **136** associated with the user selects from the FATC, the fast forward stream corresponding to the presently received content stream. Thus, a user may rapidly traverse the entire portion of content stored in the primary storage. In the case of a fast forward stream operating at nine times the frame rate of the play stream, a user will be able to traverse the entire 20 minutes of play track in only 2.22 minutes. Therefore, it is necessary that the remaining portion of the content be provided to the primary storage or, alternatively, the user be migrated to a server module including the requested content, prior to 2.22 minutes after beginning presentation of the requested content stream. While not the normal or likely user action, a user who has already seen most of the requested content may simply fast forward to that portion of the content which has not previously been viewed. Thus, it is important to insure that the provisioning of primary storage or migration of user be accomplished in a manner that "stays ahead" of the fast forward or play track demands put upon the system by the user. For example, in the case of a relatively slow secondary storage device, such as a sequentially accessed magnetic tape device in which content may be stored toward the middle or even end of a tape, it may be necessary to increase the size of the initial portion of the content stream stored on the primary storage device. Thus, the primary storage may be used to store anywhere from five minutes to 40 minutes of content, based upon the speed of secondary storage or other determination directed toward assuring a continued, uninterrupted stream of content to a requesting user. The amount of initial content storage is adapted to the system's storage capabilities (i.e., speed, access time, primary and secondary storage mix and the like) and to the acceptable acceptable probabilistic risk level of dropping a stream (i.e., allow only partial fast forward within the initial content and other limitations).

[0071] The portion of content rewind track stored in the primary storage must also be adapted to the ability of the system. Specifically, in the case of a user fast forwarding through the initial portion of content stored in the primary storage, that user may decide to rewind at some point. It is necessary to provide a rewind stream in which the user may move from a fast forward (or play) track to the rewind track. Thus, it is desirable to include a rewind track including those frames within the fast forward track.

[0072] It is noted that the play track, fast forward track and rewind tracks are all provided to the requesting user based upon user interaction. Each of these tracks is indexed in a manner facilitating transitioning between tracks such that the fast forward, rewind and play paradigms known to users from the analog video cassette recorder (VCR) world are maintained.

[0073] The above-described invention advantageously leverages the value of primary storage by using secondary storage to store portions of content likely to be not immediately required to satisfy user requests. Therefore, in a system in which thousands of titles, such as movies, are available, the above-described invention allows immediate user access to all of these titles. By contrast, previous systems stored entire content streams on a primary storage device such that only a small portion (e.g., 400 titles) of the available titles were immediately available. Users requesting content not within the primary storage had to wait until that content was retrieved from secondary storage and used to provision a primary storage device. Thus, the above-described invention reduces average latency experienced by users.

[0074] Although various embodiments which incorporate the teachings of the present invention have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.

What is claimed is:

1. Apparatus, comprising:

a primary storage module, for storing an initial portion of each of a plurality of titles;

a secondary storage module, for storing at least a remaining portion of at least one of said plurality of titles; and

a controller, for processing user requests and causing said primary storage module to begin providing an output stream including an initial portion of a requested title;

said secondary storage module provisioning said primary storage module with a remaining portion of said requested title such that said output stream includes said initial portion and said remaining portion of said requested title.

2. The apparatus of claim 1, wherein said primary storage module comprises a disk drive array and said secondary storage module comprises at least one of a magneto-optical drive and a magnetic tape drive.

3. The apparatus of claim 1, wherein said primary storage module comprises a plurality of server modules, each of said server modules having associated with it a respective disk drive array, each of said server modules being capable of servicing a plurality of users.

4. The apparatus of claim 3, further comprising:

a switch, for multiplexing the respective output streams of said server modules to form therefrom a multiplexed output stream.

5. The apparatus of claim 4, wherein each of said server modules has associated with it a respective output buffer capable of storing at least one service period of said respective server module output stream.

6. The apparatus of claim 1, further comprising:

a transport processor, for receiving an output stream from said primary storage module and causing said output stream to be transported to at least one requesting user via a distribution network.

7. The apparatus of claim 1, further comprising:

a plurality of server modules, each of said server modules being associated a respective disk array, wherein:

a server module for storing at least an initial portion of a title operates as a primary storage module with respect to that title, and a server module storing a remaining portion of said title operates as a secondary storage module with respect to that title.

8. The apparatus of claim 7, wherein a first server module operating as a primary storage module with respect to a requested title is provisioned by a second server module operating as a secondary storage module for said requested title.

9. The apparatus of claim 7, further comprising:

a switch, coupled to each of said server modules via a buffer, for multiplexing the output streams of each of said server modules to produce therefrom a multiplexed output stream for subsequent transport.

10. The apparatus of claim 9, further comprising a transport processor, for adapting the multiplexed output stream primary storage switch for transporting requested titles to requesting users via a forward application transport channel (FATC).

11. The apparatus of claim 9, wherein each of said respective server module buffers comprises a respective portion of a common memory module, said switch further comprising a direct memory access (DMA) output table for identifying the appropriate portions of the common memory module including data to be retrieved and provided to said switch output.

12. The apparatus of claim 8, wherein:

each of said server modules is capable of servicing a plurality of users, and an overutilized server module is capable of migrating serviced users to an underutilized server module.

13. Apparatus, comprising:

an information server, for storing at least an initial portion of each of a plurality of titles;

a controller, for processing user requests and causing said information server to begin providing an output stream including at least said initial portion of a requested title to a transport processor; and

a remote storage module, for storing at least a remaining portion of at least one of said plurality of titles, said remote storage module providing as necessary to said information server said remaining portion of requested titles.

14. The apparatus of claim 13, wherein said transport processor adapts said information server output stream to a format suitable for use in a forward application transport channel (FATC) delivering requested titles to users.

15. In an interactive information distribution system including provider equipment and subscriber equipment, said provider equipment communicating with said subscriber equipment via a network, provider apparatus comprising:

a controller, for interacting with subscribers to receive title requests;

an information server, for storing titles and providing an output stream including titles requested by said subscribers; and

a transport processor, for transport encoding said output stream for subsequent distribution via said network;

said information server comprising a plurality of server modules, each of said server modules operating as at least one of a primary storage module and a secondary storage module, wherein a primary storage module store at least initial portions of a title and responsively provide said output stream including said initial portion of said title, and said secondary storage module stores at least a remaining portion of said title and provisions said primary storage module with said remaining portion of said title.

16. The apparatus of claim 15, wherein each server module is operably coupled to at least one primary storage device for storing at least an initial portion of each of a plurality of available content streams, and at least one secondary storage device for storing the remaining portion of at least one of said content streams.

17. The apparatus of claim 16, wherein said primary storage device comprises a disk drive array and said secondary storage device comprises at least one of a magneto-optical drive and a magnetic tape drive.

18. The apparatus of claim 15, further comprising:

a switch, coupled to each of said server modules via a respective buffer, for multiplexing the respective output streams of said server modules to form therefrom a multiplexed output stream.

19. The apparatus of claim 18, wherein each of said respective server module buffers comprises a respective portion of a common memory module, said switch further comprising a direct memory access (DMA) output table for identifying the appropriate portions of the common memory module to be retrieved and provided to said switch output.

20. The apparatus of claim 19, wherein each respective buffer is capable of storing at least one service period of said respective output stream.

21. A method, comprising the steps of:

accessing a content stream including at least an initial portion of a requested title, said initial portion being stored in a primary storage device;

initiating the streaming of said accessed content stream to a requesting user;

determining a location of a content stream including a remaining portion of said requested title; and

provisioning said primary storage device with said content stream including said remaining portion of said requested title.

22. The method of claim 21, wherein said content stream including said remaining portion of said requested title is stored on a secondary storage device.

23. The method of claim 22, wherein said primary storage device comprises one of a plurality of server modules having stored therein said content stream including said initial portion of said requested title; and

said secondary storage device comprises one of a plurality of server modules having stored therein said content stream including said remaining portion of said requested title.

24. The method of claim 23, wherein each of said server modules functions as at least one of a primary storage device and a secondary storage device, wherein a server module storing a content stream including an initial portion of a title operates as a primary storage device with respect to that title, and a server module storing a content stream including a remaining portion of said title operates as a secondary storage device with respect to that title.

25. The method of claim 23, wherein each of said server modules is capable of servicing a plurality of users, said method further comprising:

determining a utilization level for each server module; and

migrating at least one user from an overutilized server module to a non-overutilized server module.

26. Method of claim 21, further comprising:

migrating a user receiving said content stream from said primary storage device to said secondary storage device where said secondary storage device comprises a server module.

27. Method of claim 21, further comprising:

migrating a user receiving said content stream from said primary storage device to said secondary storage device when a user load balancing among storage devices is appropriate.

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(54) SYSTEM FOR PROVIDING CONTENT, MANAGEMENT, AND INTERACTIVITY FOR THIN CLIENT DEVICES

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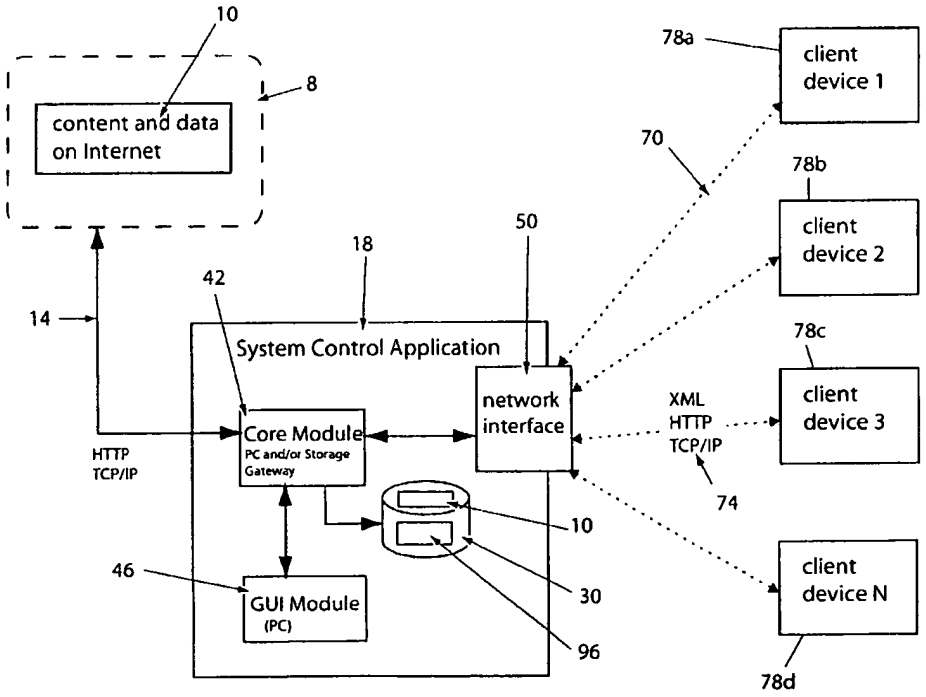
(57) ABSTRACT

A system is provided for delivering Internet and digital content to a variety of thin client devices. A web portal for accessing and selecting content is used in conjunction with graphical user interfaces on a personal computer for setting up and controlling the content channels. The user interfaces, scheduling, and communication management are controlled by a system control software application running on a local server with an Internet connection. A high speed local area network provides for streaming content from the Internet or local server to thin client devices. A digital audio playback device is connected to the local server via the local area network connection and decodes streamed audio files, and converts them into analog audio signals for input into a conventional stereo. Digital content is streamed automatically from the local server to another Internet playback device, based on end user content preferences and schedule selections.



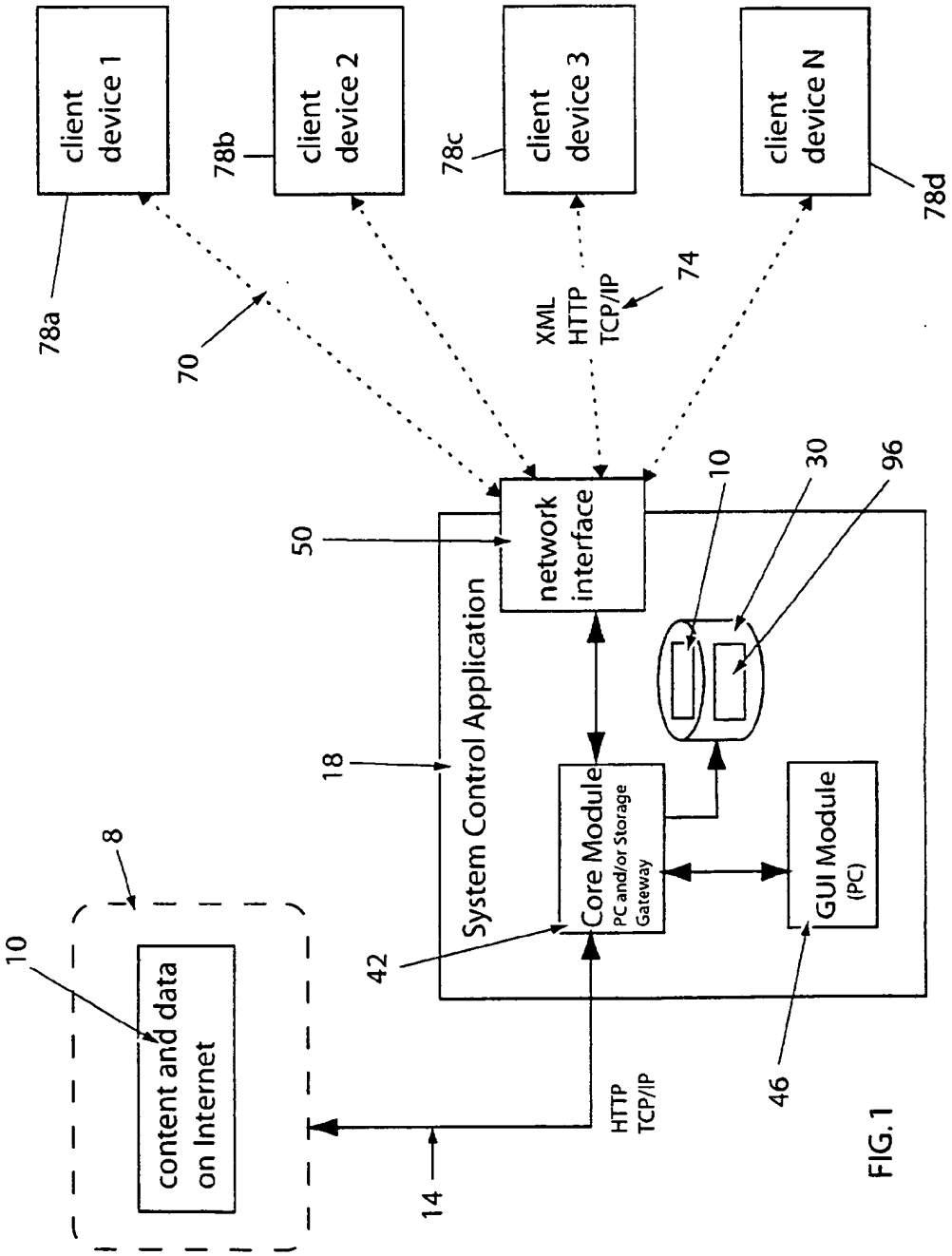

client device 1
client device 2
client device 3
client device N
78a
78b
78c
78d
70
74
XML
HTTP
TCP/IP
network interface
50
10
30
96
System Control Application
18
Core Module
PC and/or Storage Gateway
GUI Module
(PC)
42
46
8
10
content and data on Internet
14
HTTP
TCP/IP

FIG. 1

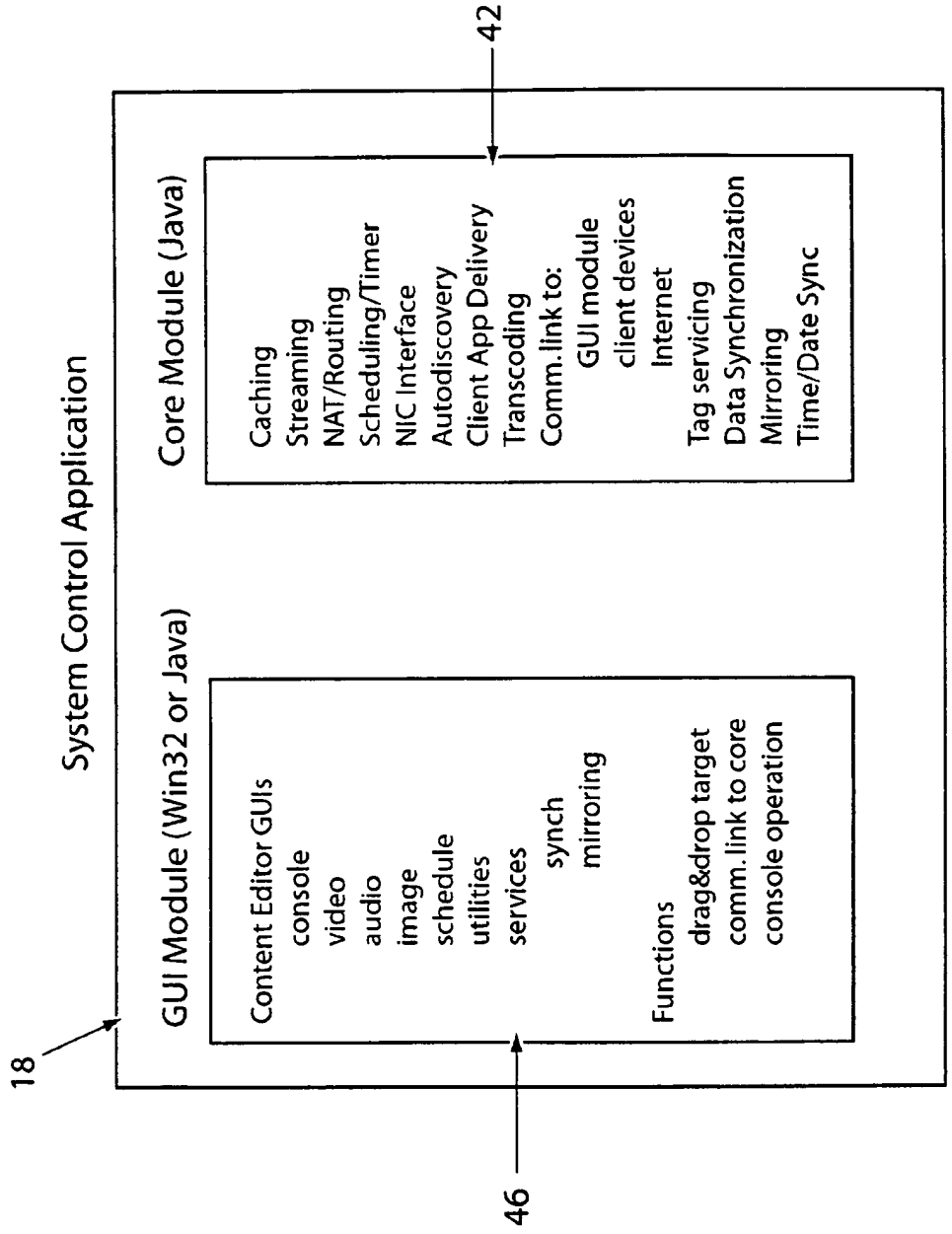

System Control Application
GUI Module (Win32 or Java)
Content Editor GUIs
console
video
audio
image
schedule
utilities
services
synch
mirroring
Functions
drag&drop target
comm. link to core
console operation
Core Module (Java)
Caching
Streaming
NAT/Routing
Scheduling/Timer
NIC Interface
Autodiscovery
Client App Delivery
Transcoding
Comm. link to:
GUI module
client devices
Internet
Tag servicing
Data Synchronization
Mirroring
Time/Date Sync
18
42
46

FIG. 2

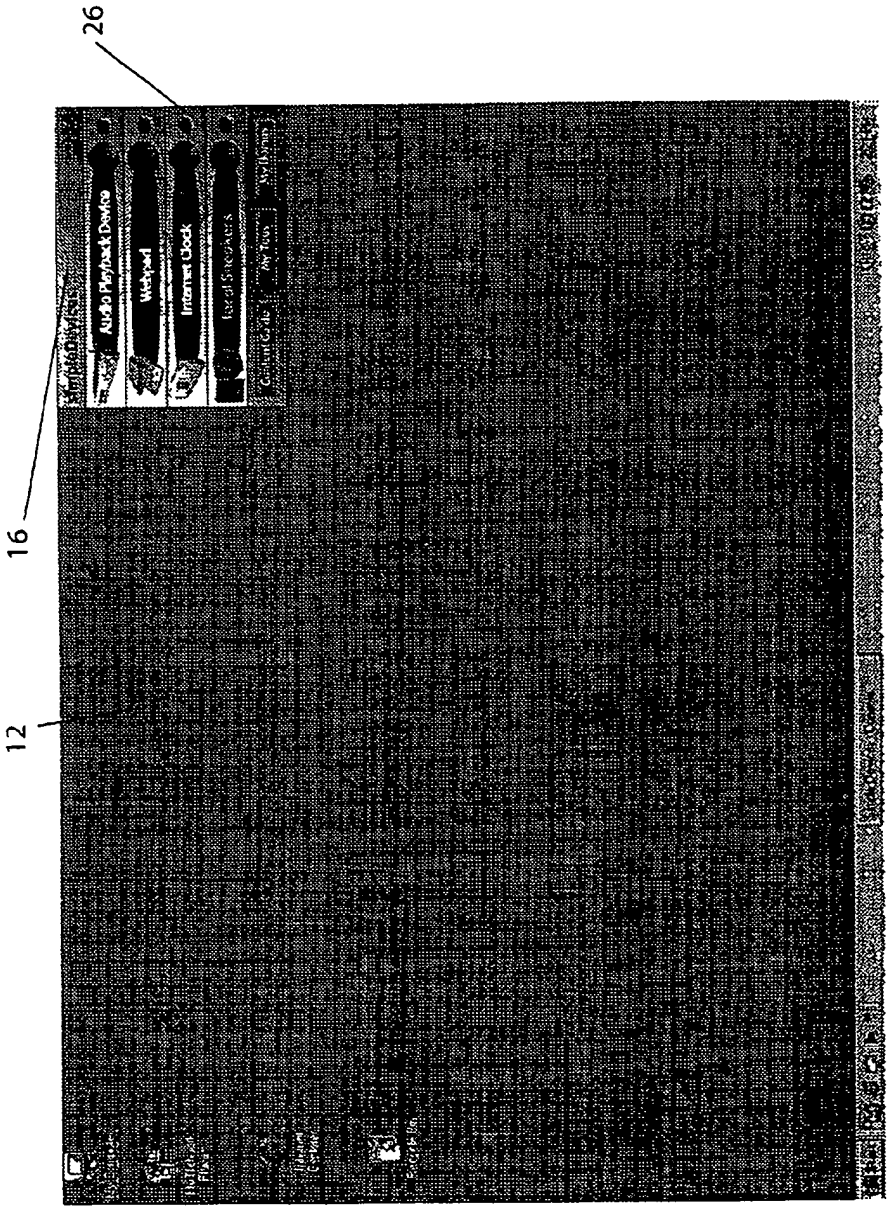


FIG.3

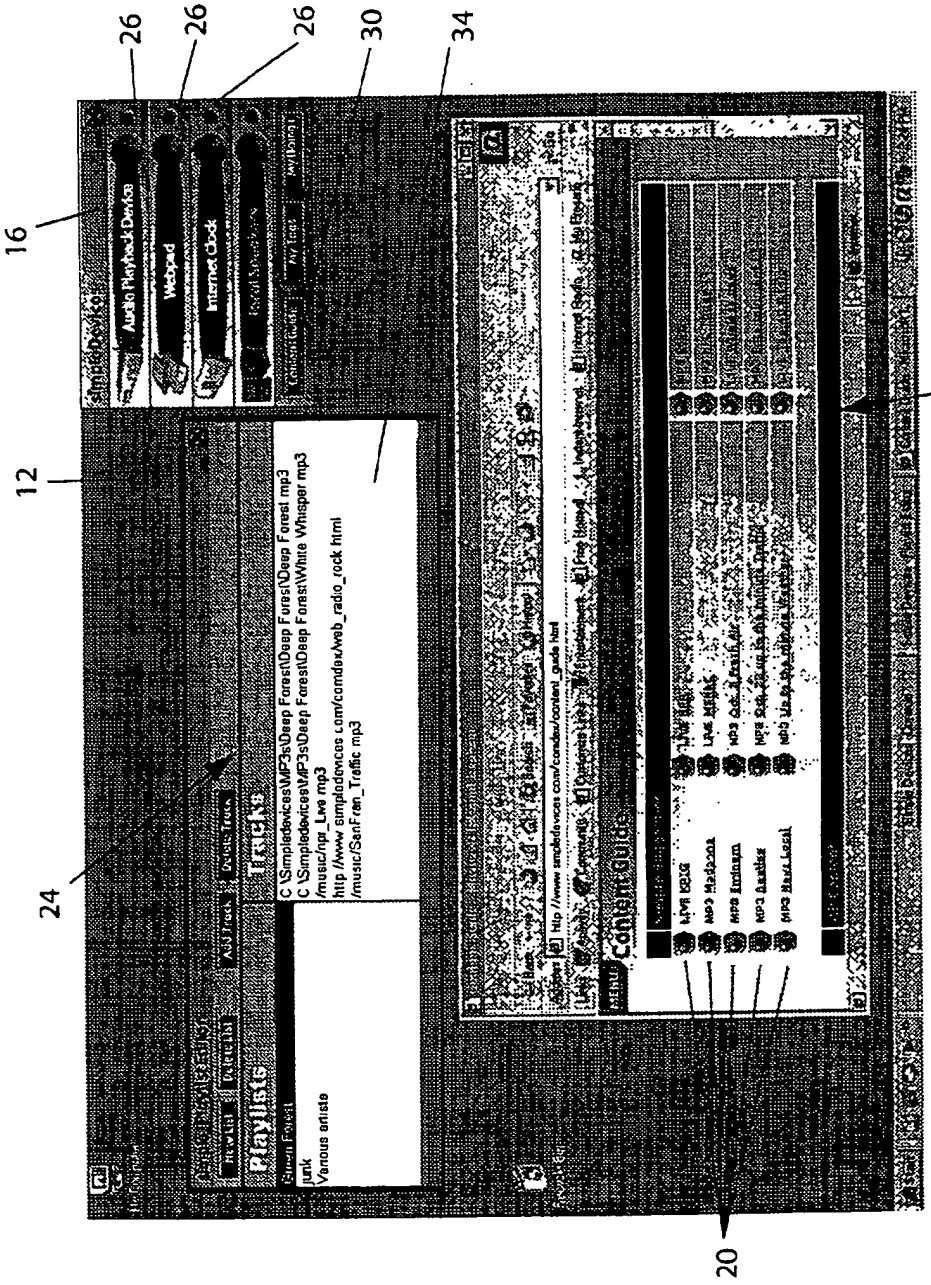

26
26
26
30
34
16
12
24
22
20
Audio Playback Device
Webpad
Internet Clock
Playlists
Content Guide
C:\SimpleDevices\MP3s\Deep Forest\Deep Forest mp3
C:\SimpleDevices\MP3s\Deep Forest\White Whisper mp3
/music/npr_Live mp3
http://www.simpledevices.com/comdex/web_radio_rock.html
/music/SanFran_Traffic mp3
Deep Forest
Junk
Various artists

FIG. 4

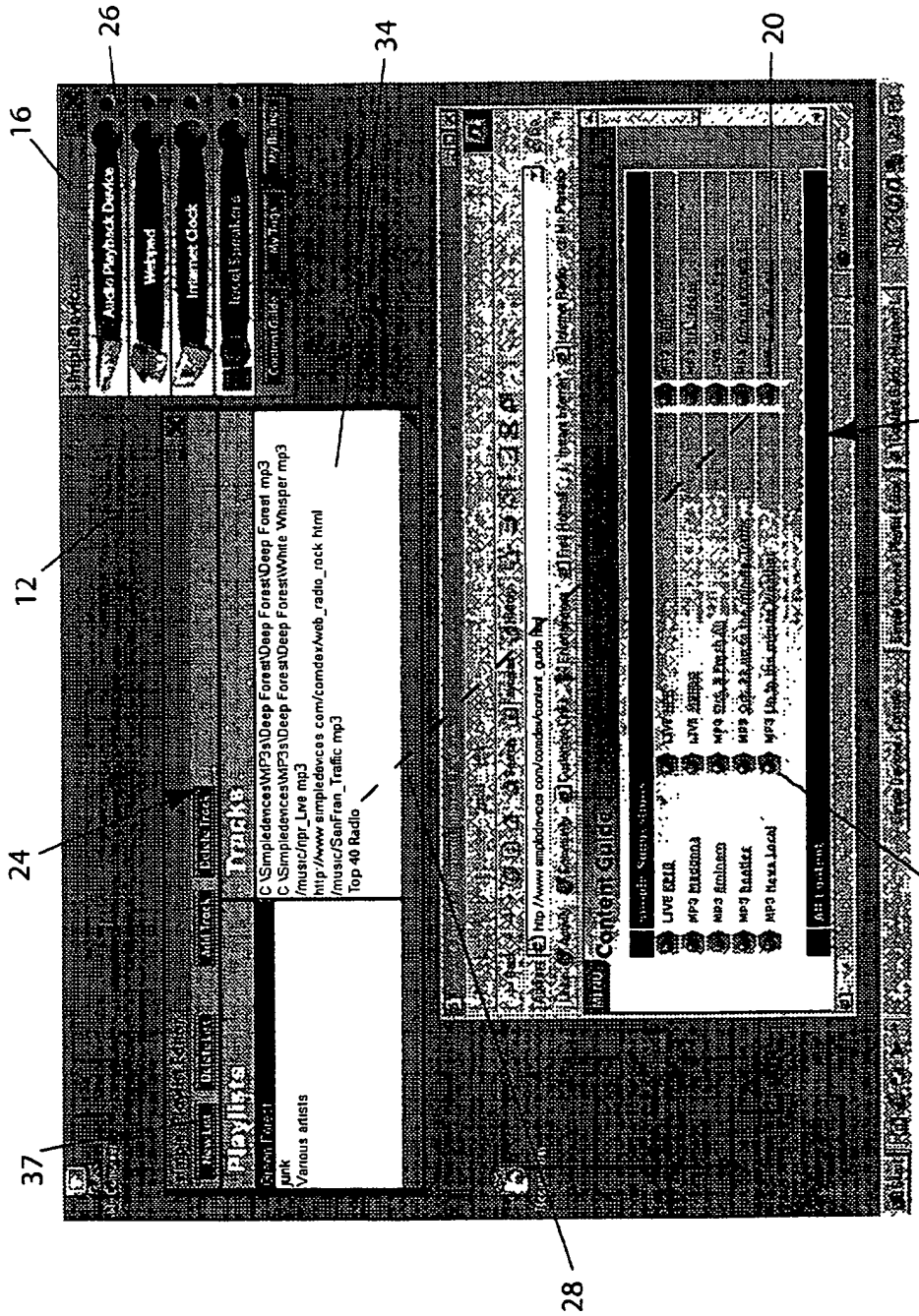

26
34
20
16
12
22
24
20
37
28
Audio Playback Device
Webpad
Internet Clock
Local Speakers
Playlists
Content Guide
C:\SimpledevicesMP3s\Deep Forest\Deep Forest mp3
C:\SimpledevicesMP3s\Deep Forest\White Whisper mp3
/music/npr_Live mp3
http://www.simpledevices.com/comdex/web_radio_rock.html
/music/SanFran_Traffic mp3
Top 40 Radio
Junk
Various artists

FIG. 5

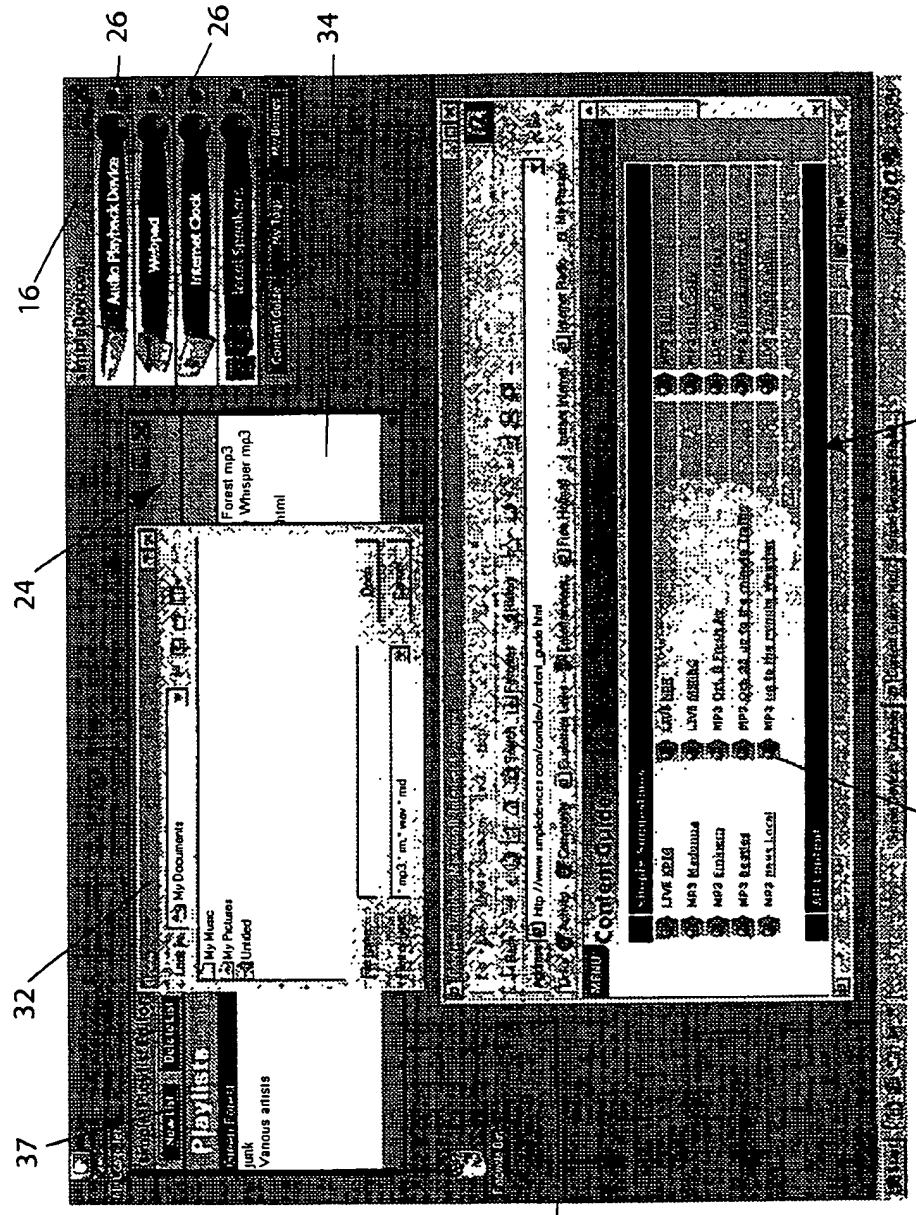

26
26
34
16
24
32
37
12
22
20
Playlists
My Music
My Pictures
Untitled
Various artists
junk
Forest mp3
Whisper mp3
Internet Clock
Webpad
Content Guide

FIG. 6

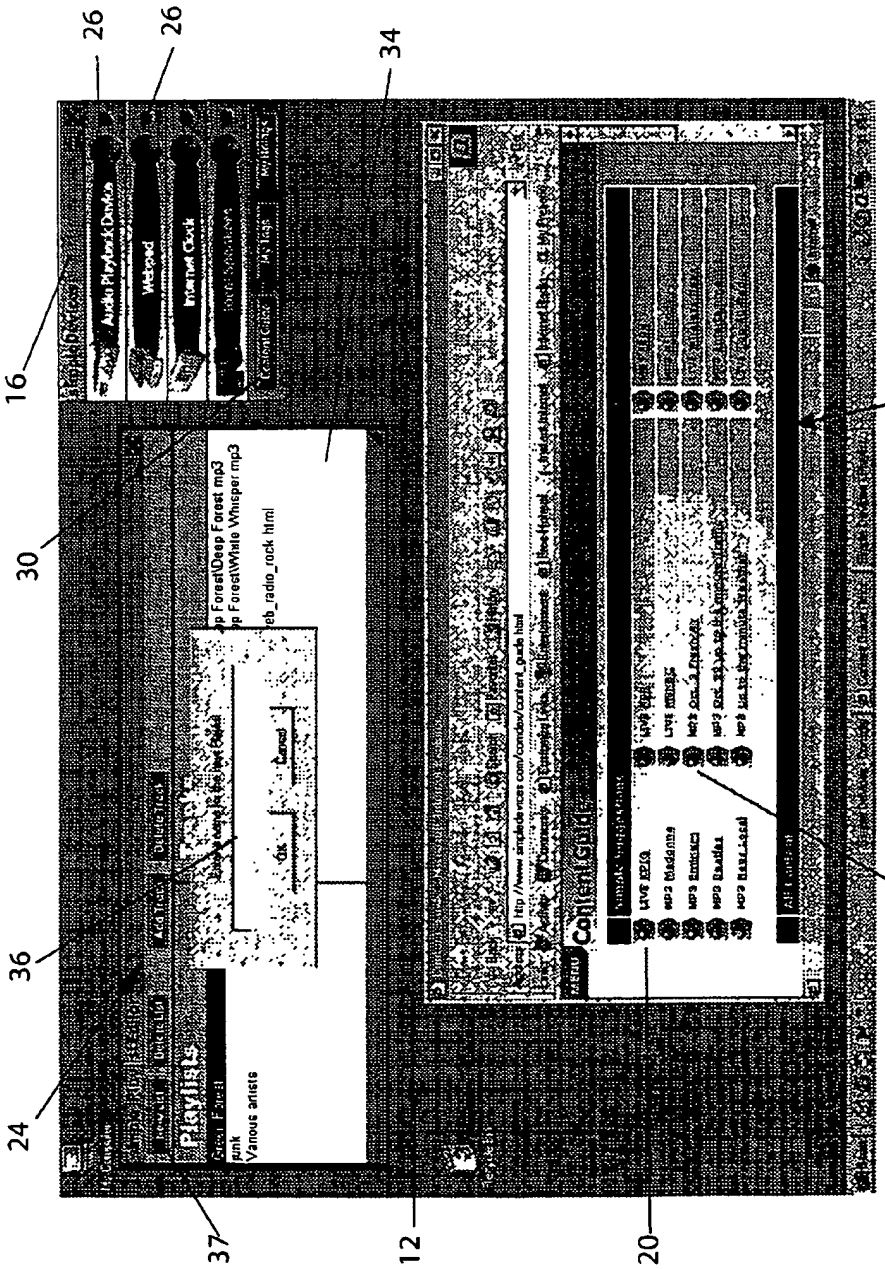


FIG. 7

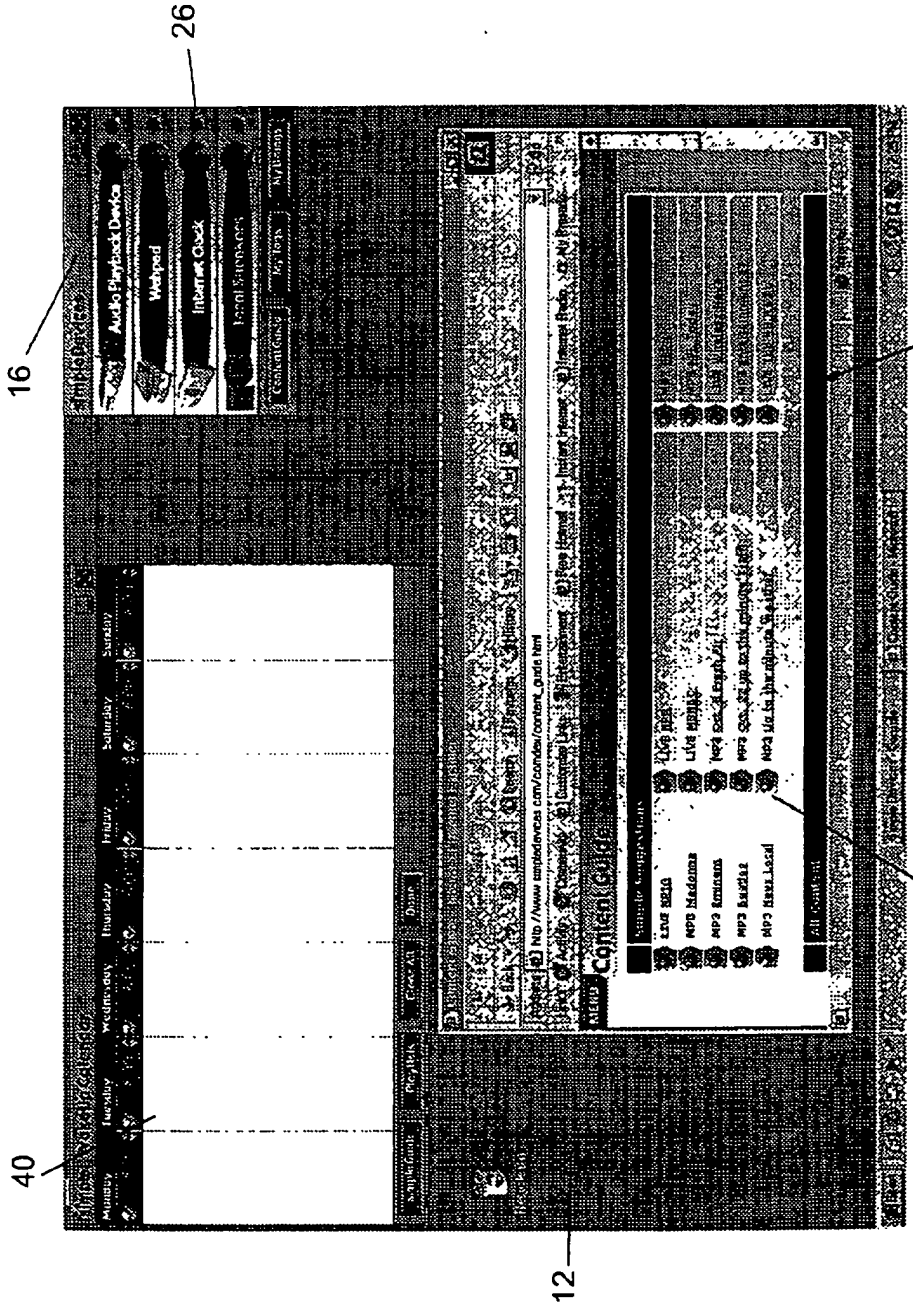

26
16
22
20
40
12
Audio Playback Device
Webpad
Internet Clock
Content Guide

FIG. 8

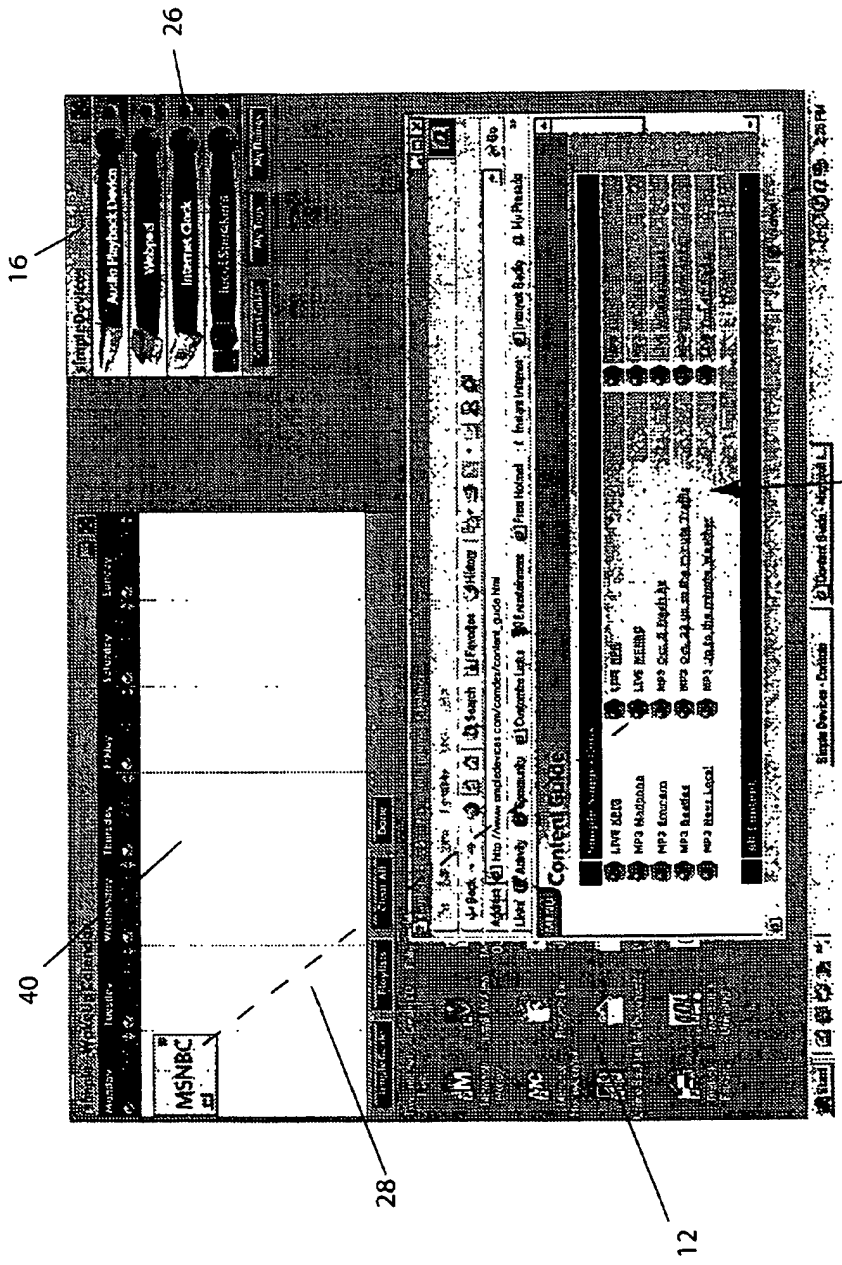


FIG. 9

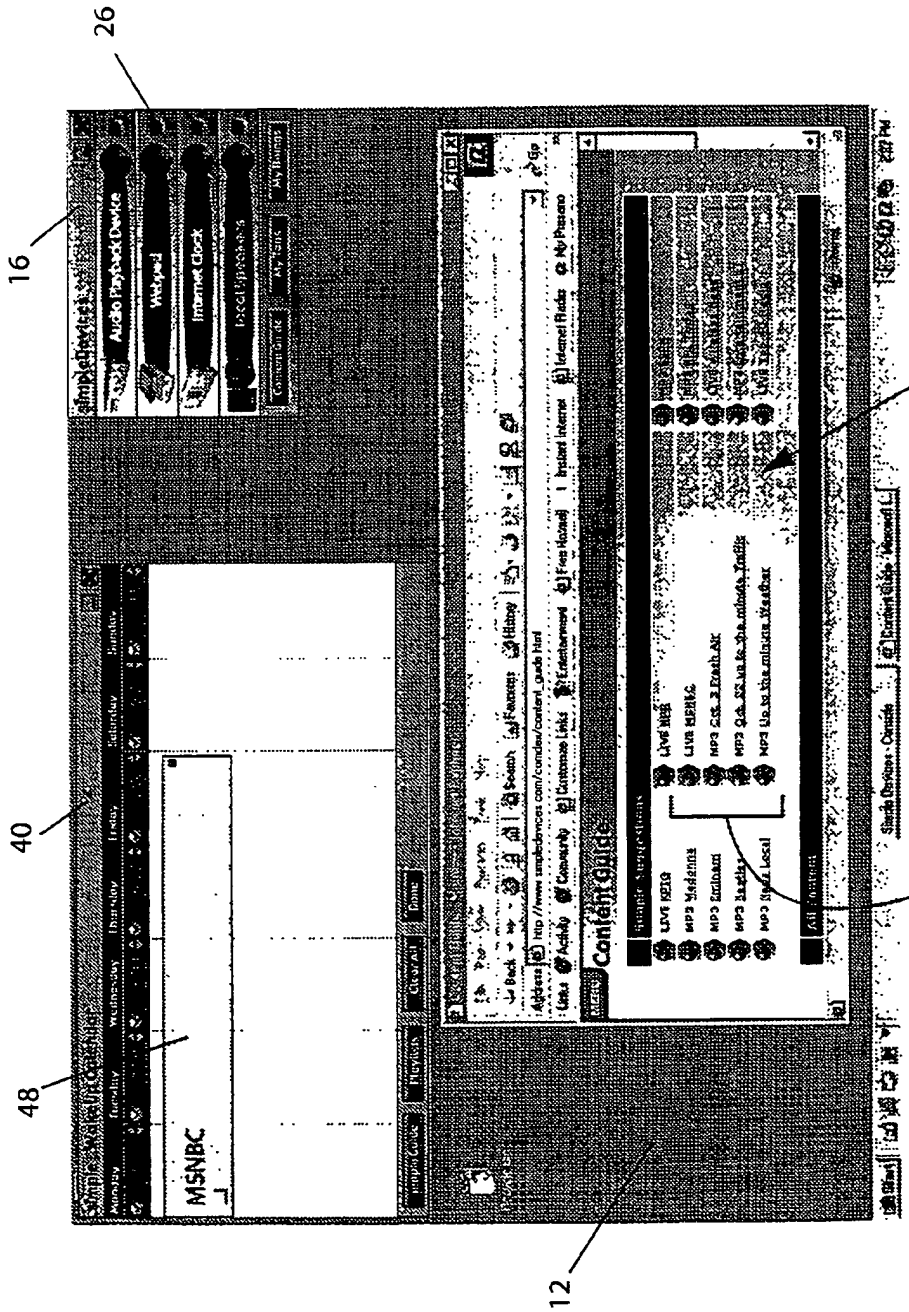


FIG.10

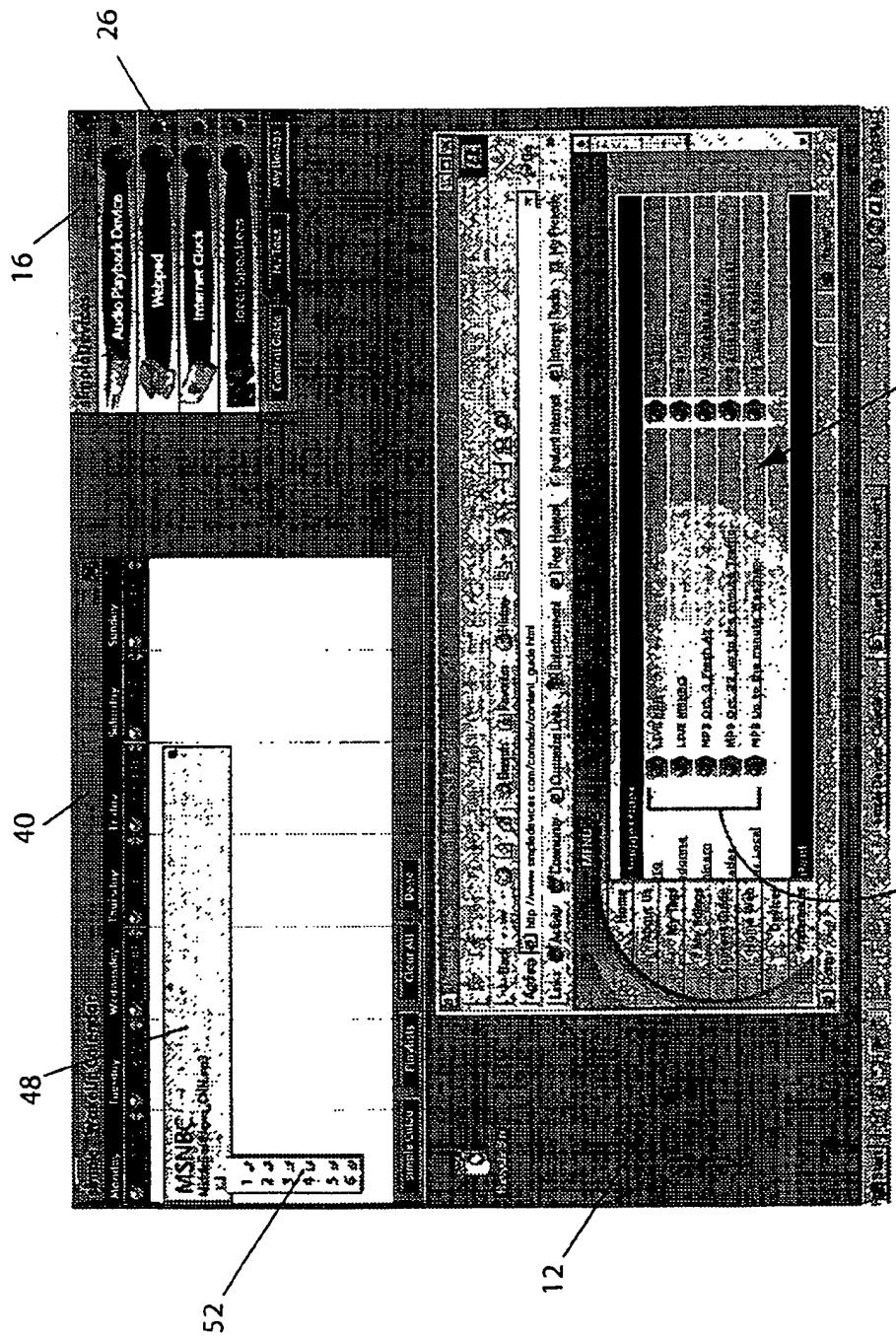

26
16
40
48
52
12
20
22
Audio Playback Device
Webpad
Internet Clock
MSNBC

FIG.11

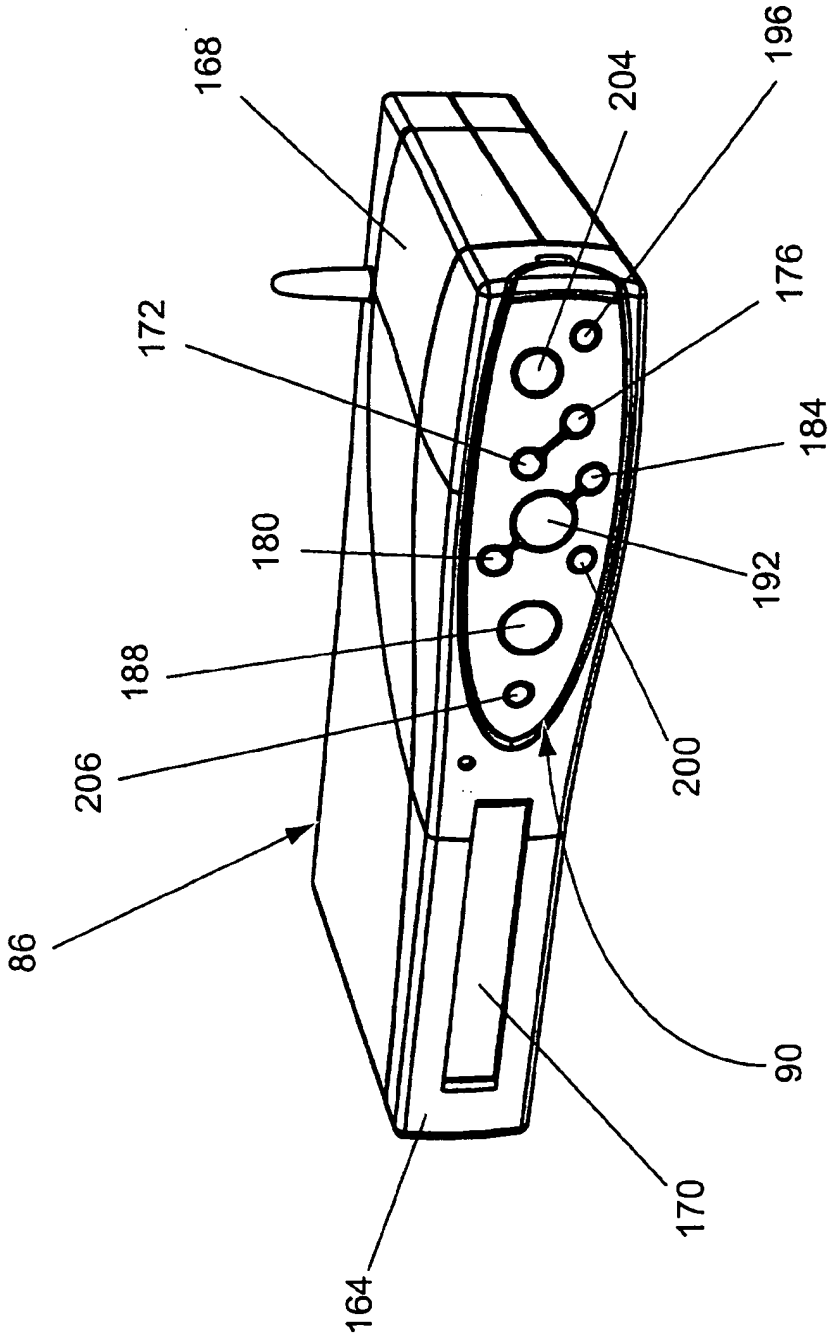


FIG. 12

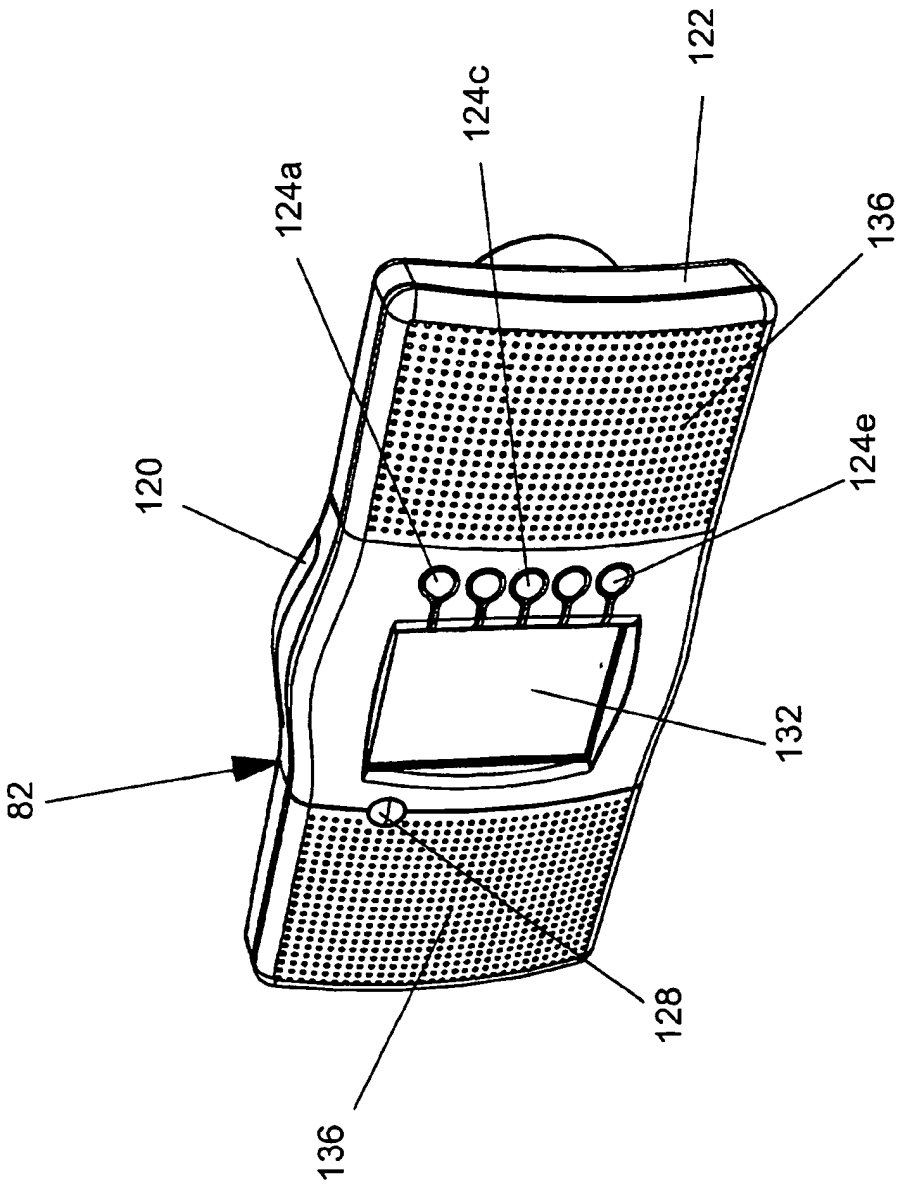


FIG. 13

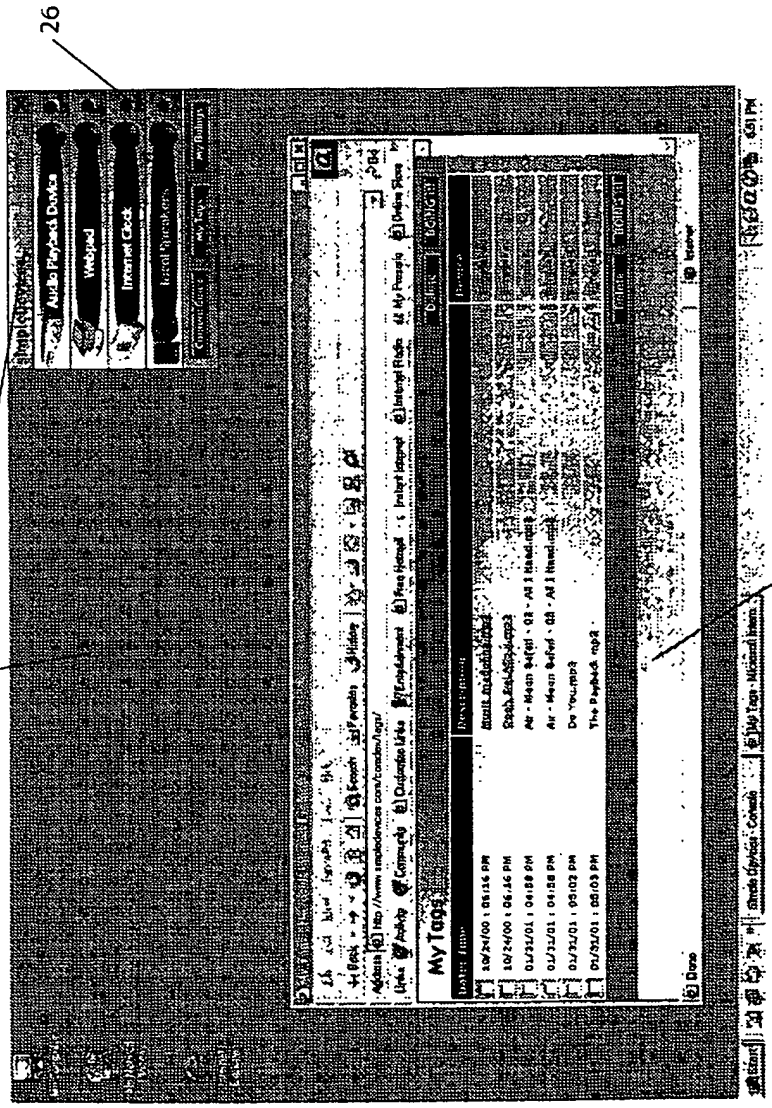

26
16
12
56
Audio Players Device
Webpad
Internet Clock
My Tags

FIG. 14

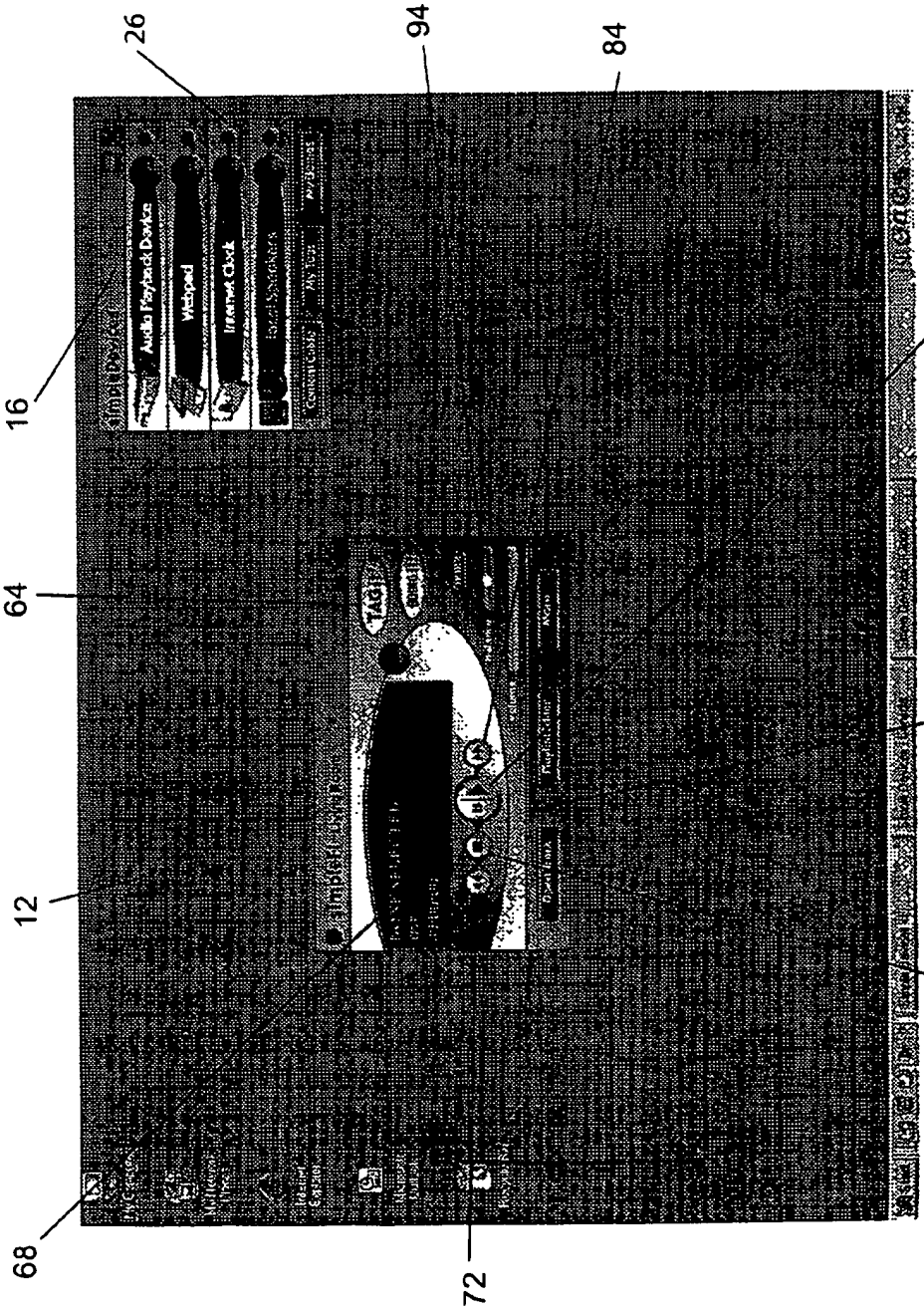


FIG. 15

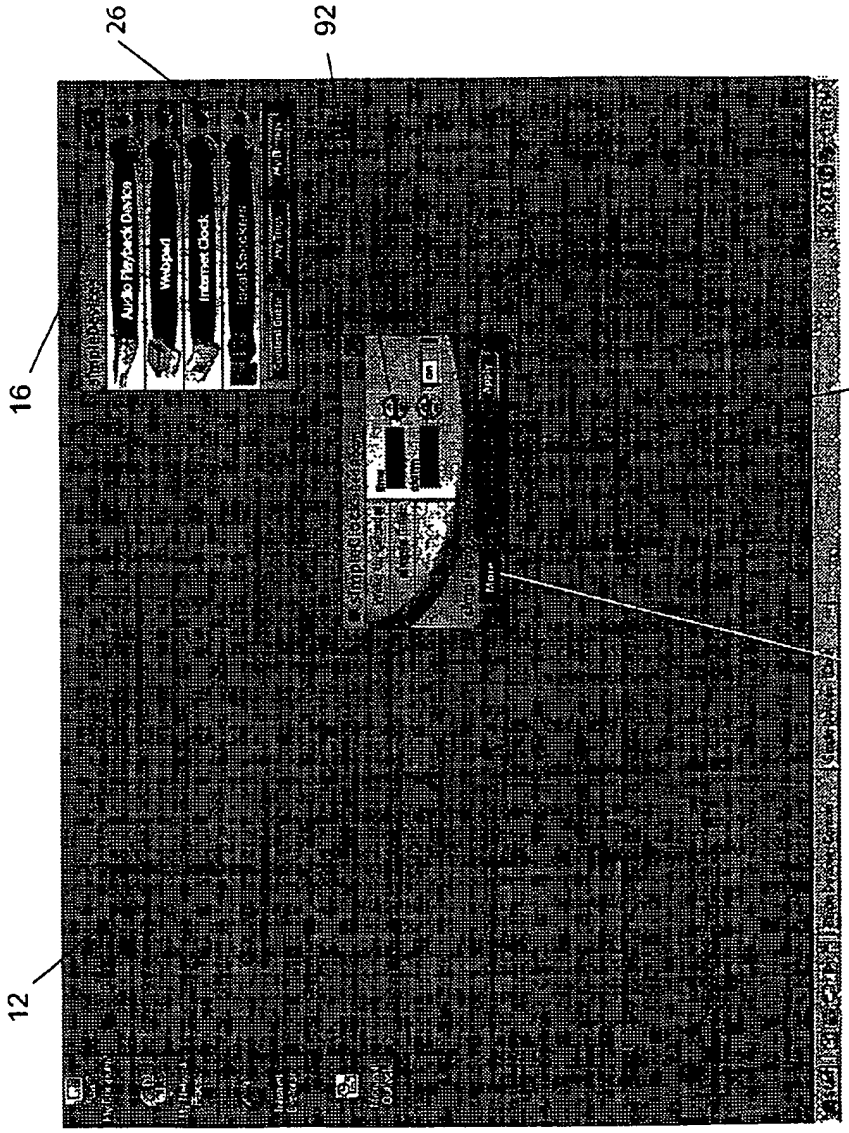


FIG. 16

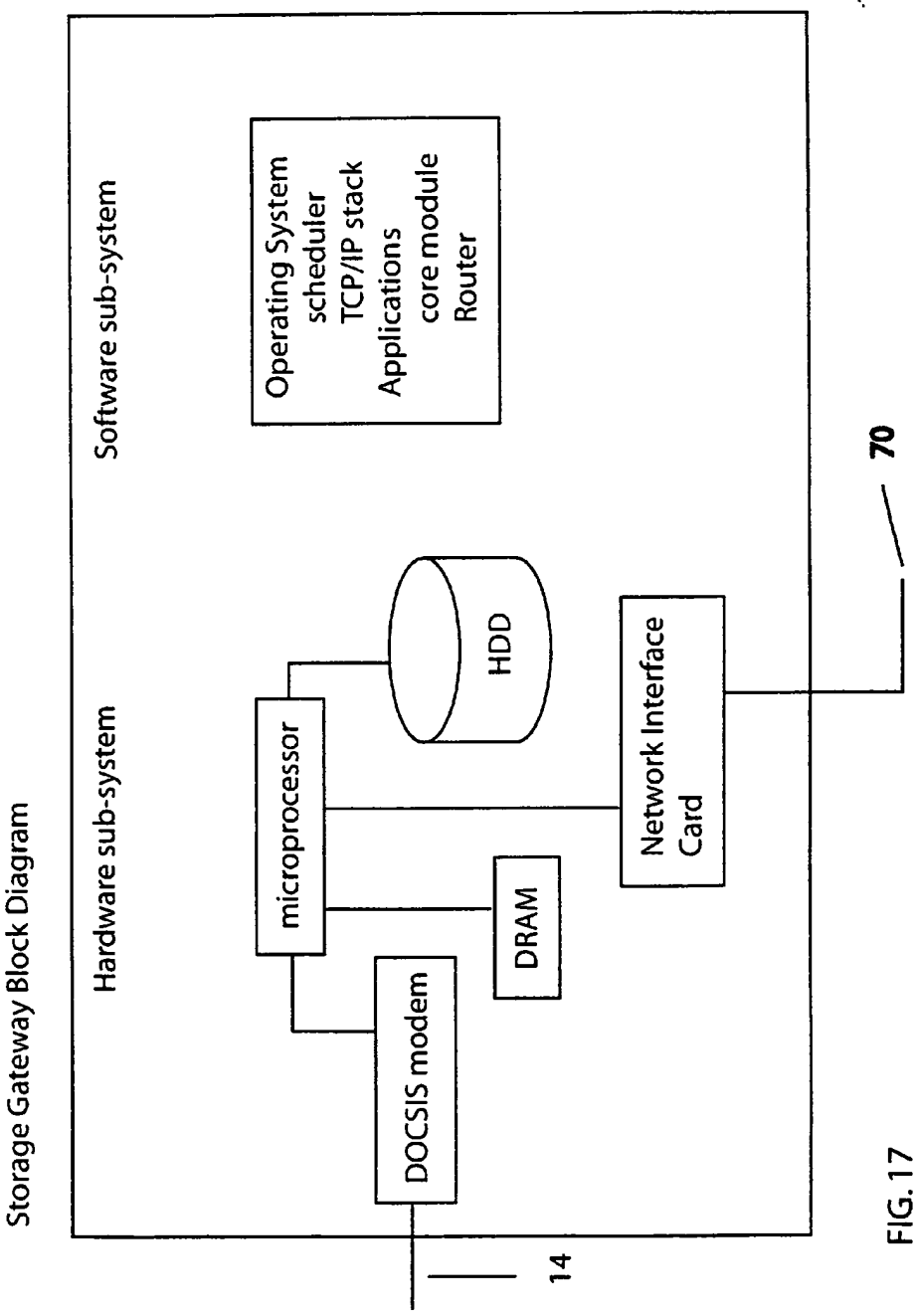

Storage Gateway Block Diagram
Hardware sub-system
Software sub-system
Operating System
scheduler
TCP/IP stack
Applications
core module
Router
microprocessor
HDD
Network Interface
Card
DRAM
DOCSIS modem
14
70

FIG. 17

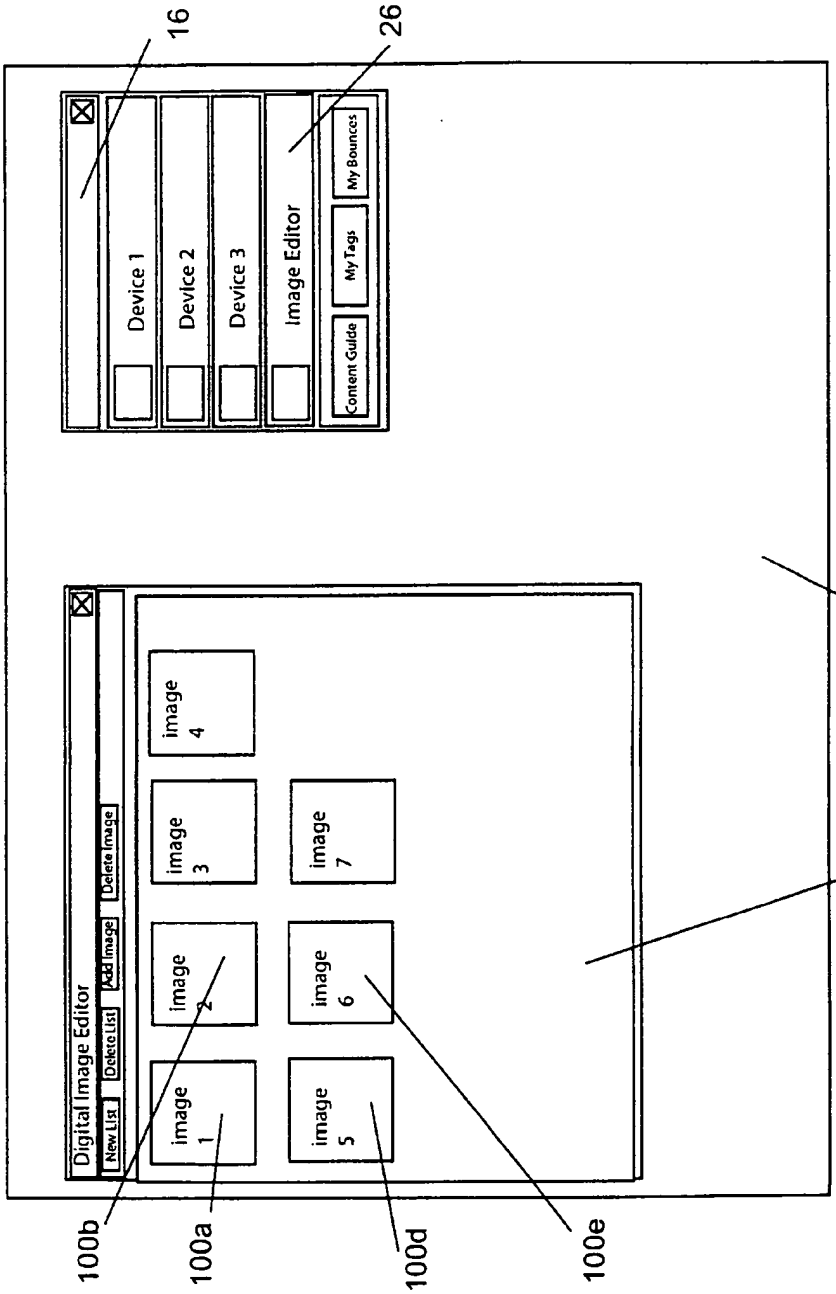

16
26
Device 1
Device 2
Device 3
Image Editor
My Bounces
My Tags
Content Guide
Digital Image Editor
New List
Delete List
Add Image
Delete Image
image 1
image 2
image 3
image 4
image 5
image 6
image 7
12
96
100b
100a
100d
100e

FIG. 18

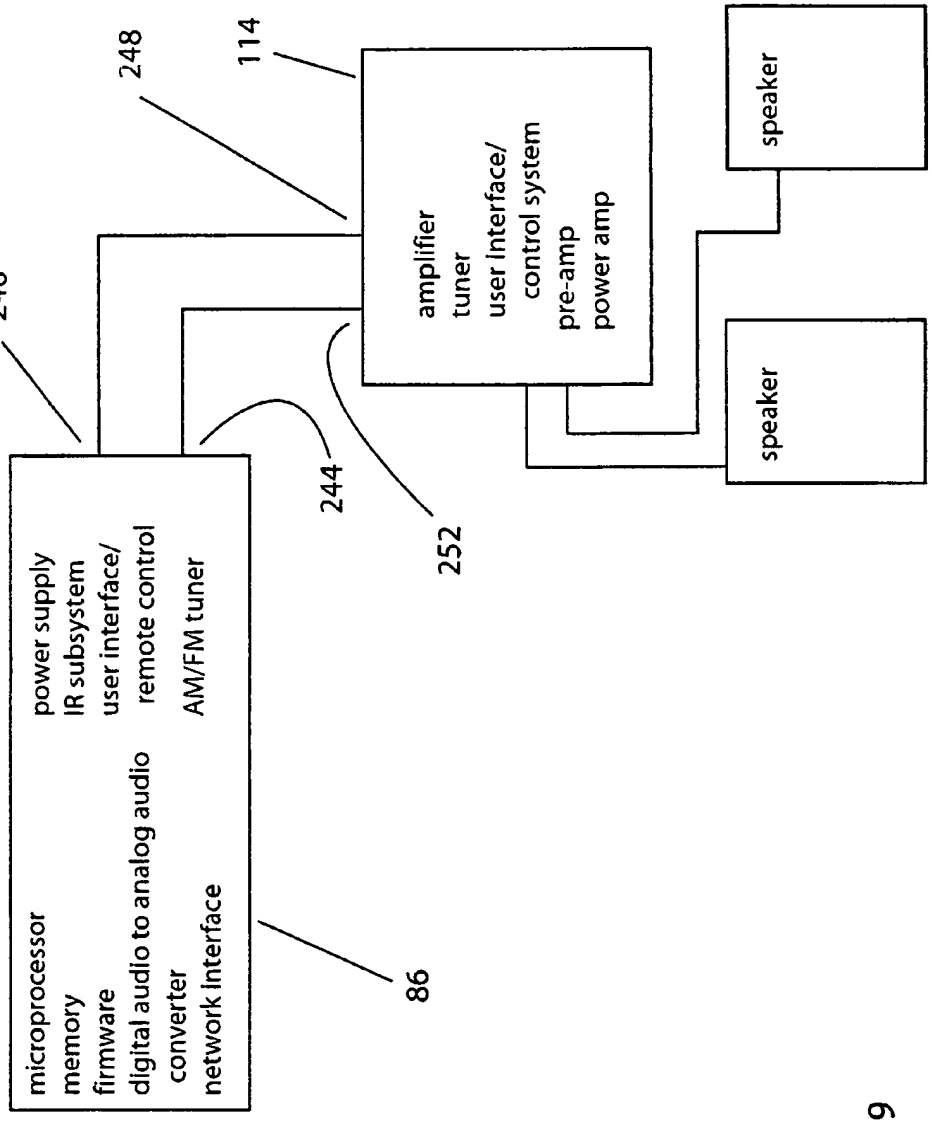

240
248
114
244
252
86
microprocessor
memory
firmware
digital audio to analog audio converter
network interface
power supply
IR subsystem
user interface/ remote control
AM/FM tuner
amplifier
tuner
user interface/ control system
pre-amp
power amp
speaker
speaker

FIG. 19

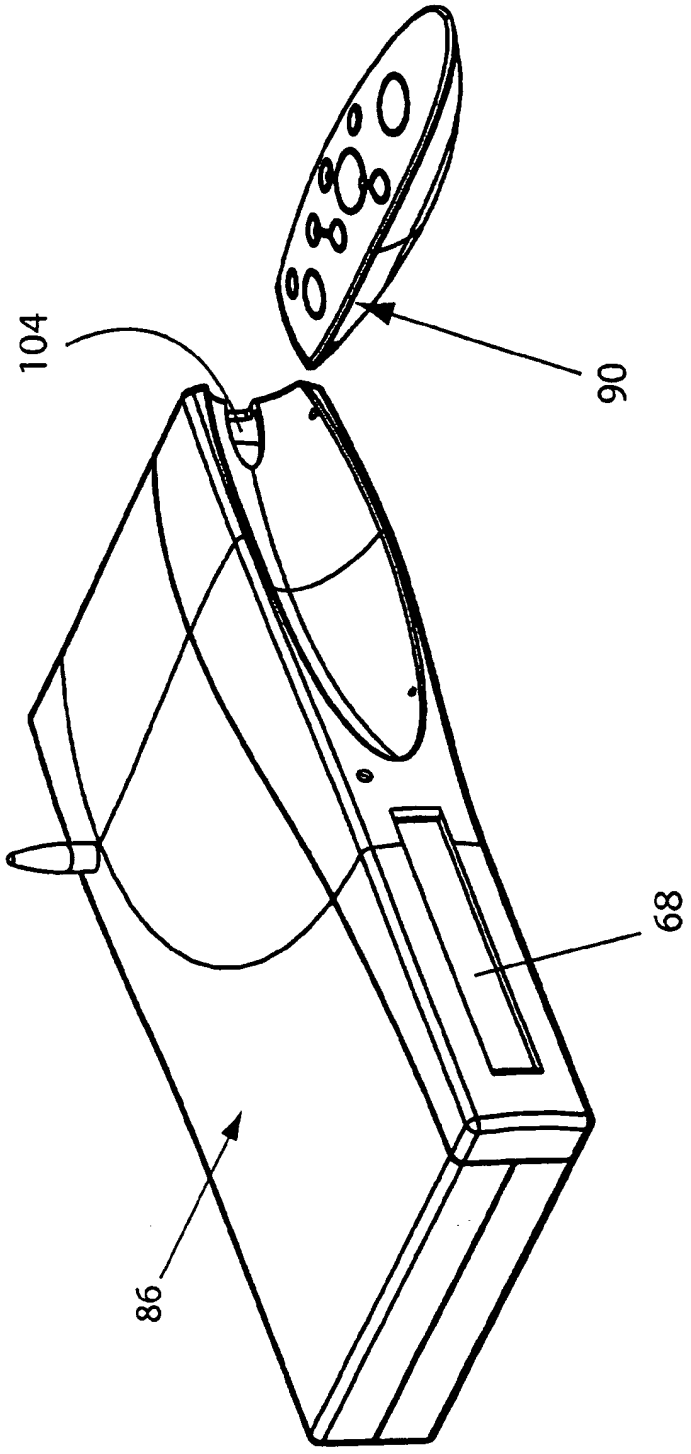


FIG. 20

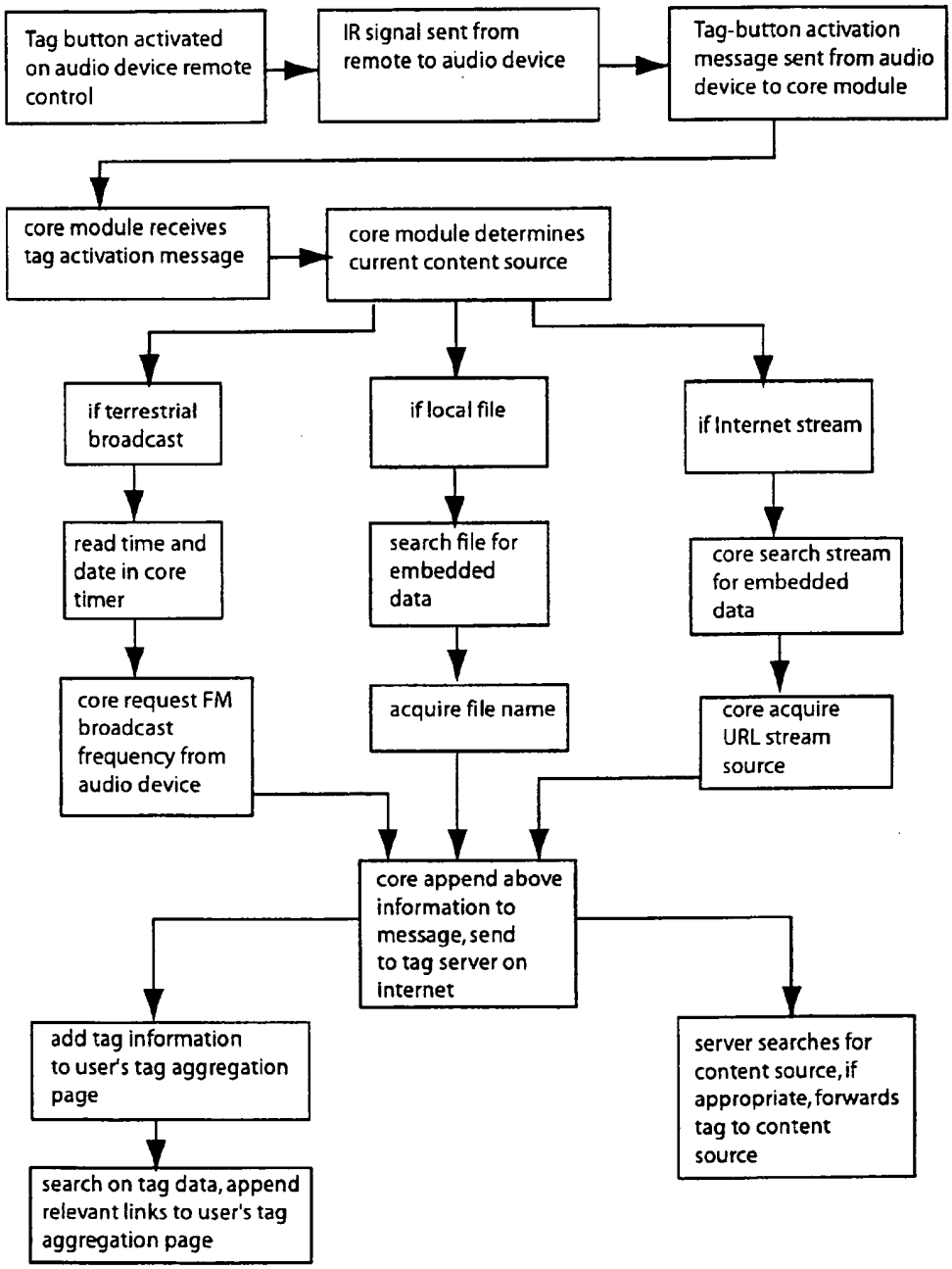

Tag button activated on audio device remote control
IR signal sent from remote to audio device
Tag-button activation message sent from audio device to core module
core module receives tag activation message
core module determines current content source
if terrestrial broadcast
if local file
if Internet stream
read time and date in core timer
search file for embedded data
core search stream for embedded data
core request FM broadcast frequency from audio device
acquire file name
core acquire URL stream source
core append above information to message, send to tag server on internet
add tag information to user's tag aggregation page
search on tag data, append relevant links to user's tag aggregation page
server searches for content source, if appropriate, forwards tag to content source

FIG. 21

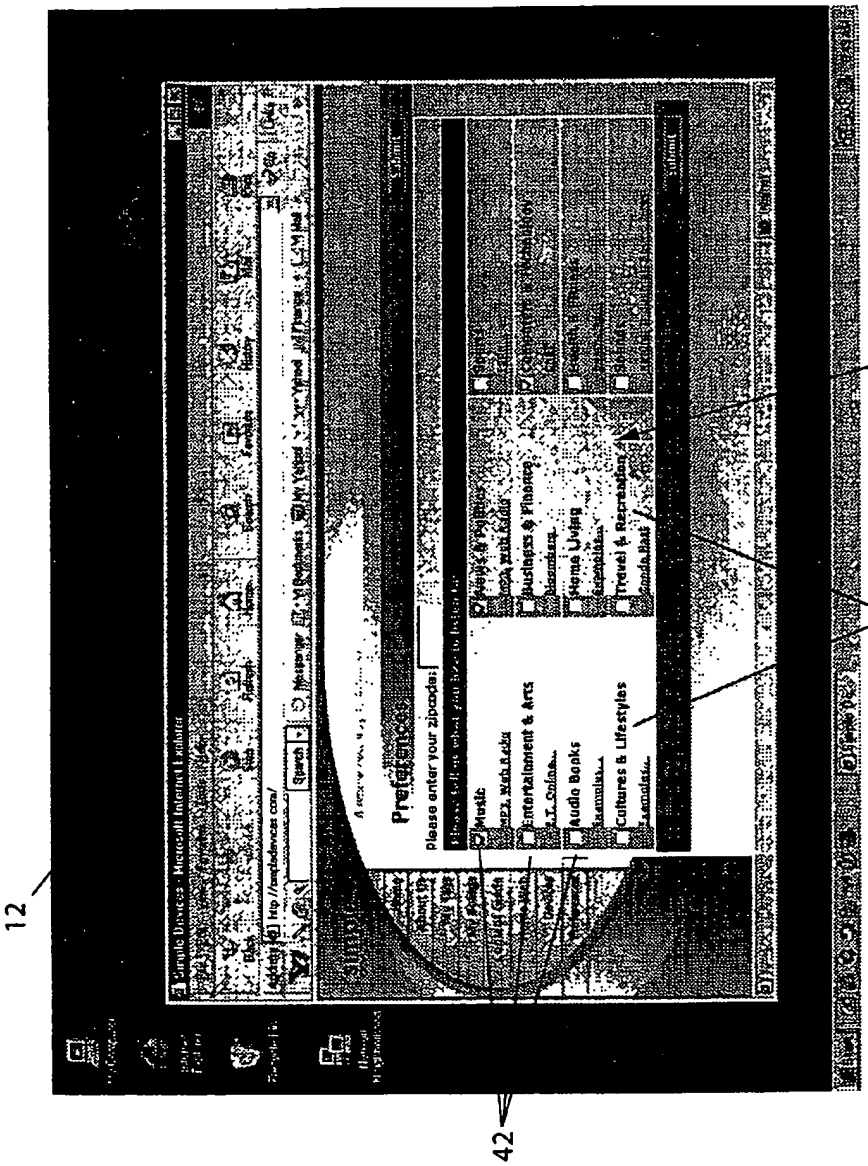

12
24
46
42
Preferences
Please enter your zipcode:
Music
Entertainment & Arts
Audio Books
Cultures & Lifestyles
Hobbies & Pastimes
Home Living
Travel & Recreation

FIG. 22

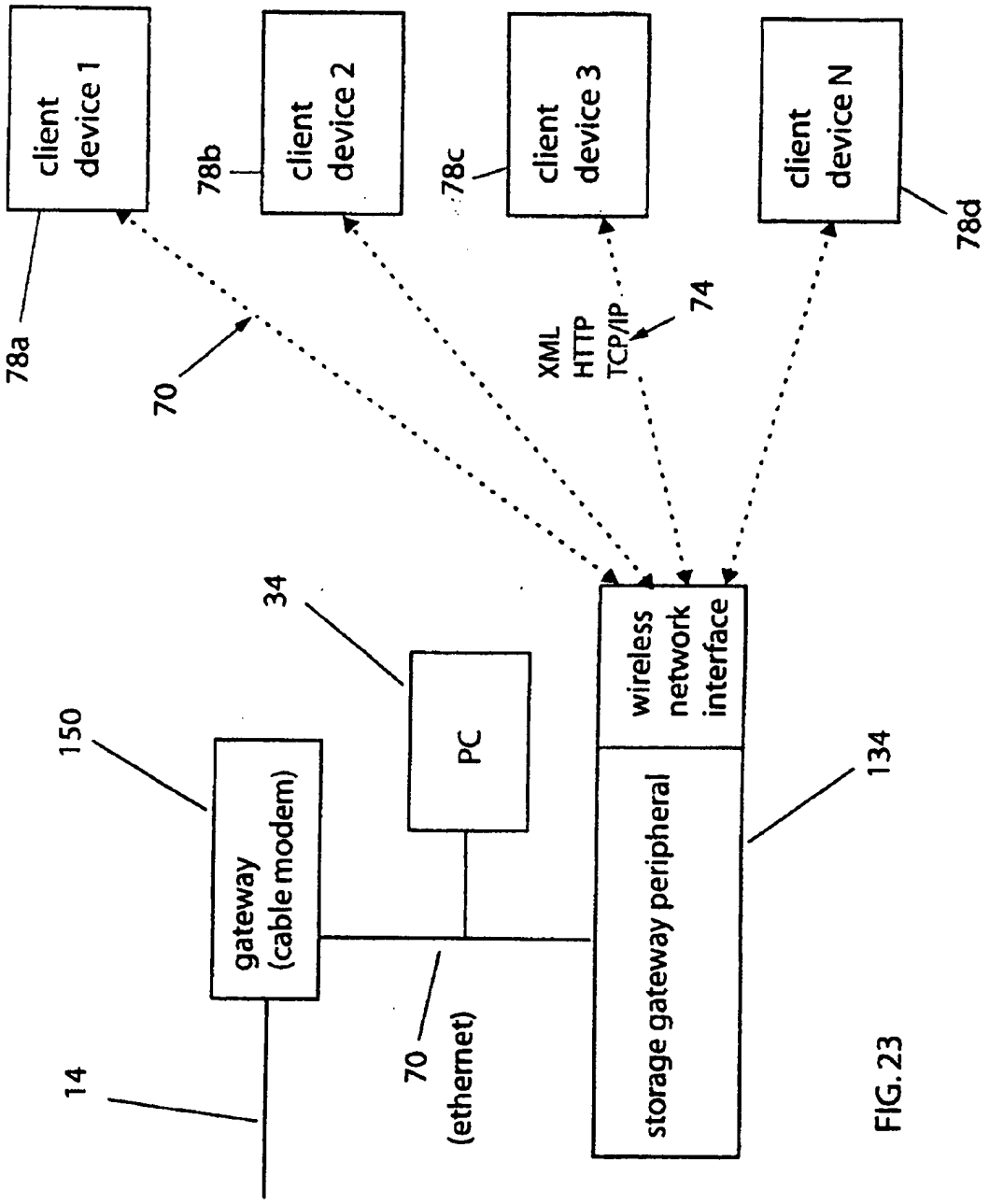

client device 1
client device 2
client device 3
client device N
78a
78b
78c
78d
70
74
XML
HTTP
TCP/IP
34
PC
wireless network interface
150
gateway (cable modem)
134
storage gateway peripheral
14
70
(ethernet)

FIG. 23

Home PC Information Appliance Server Setup Flow Chart

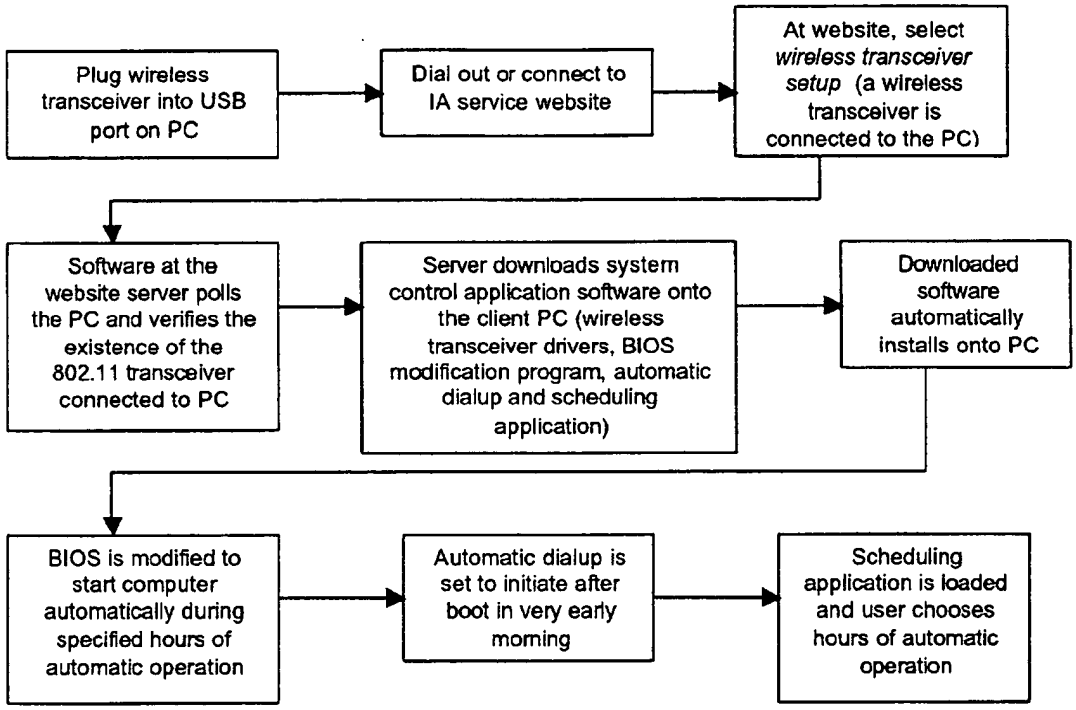


FIG. 24

Client Device Content Selection Interface

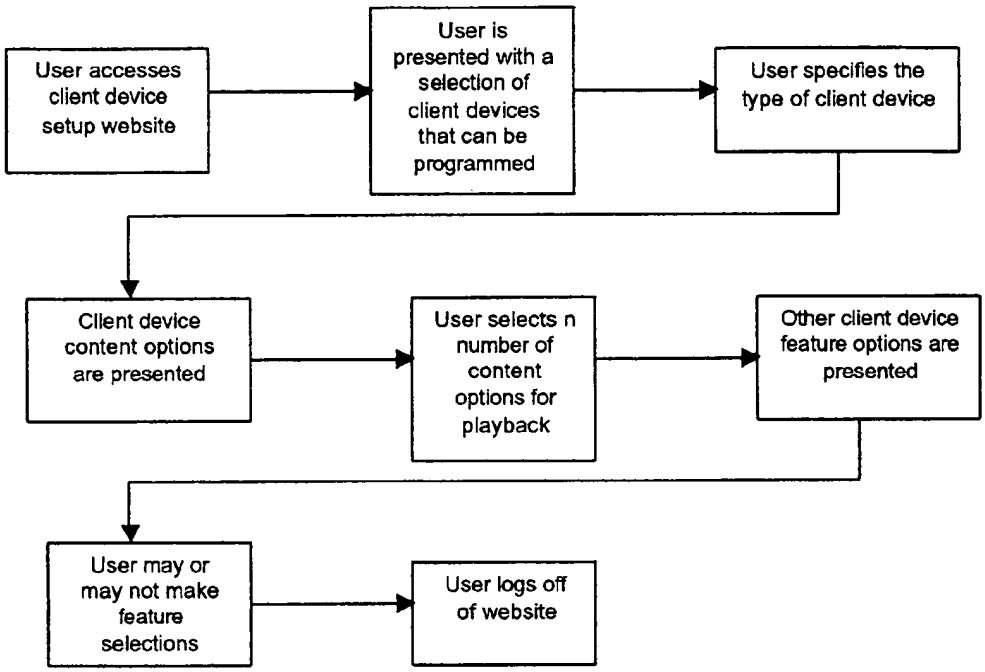


FIG. 25

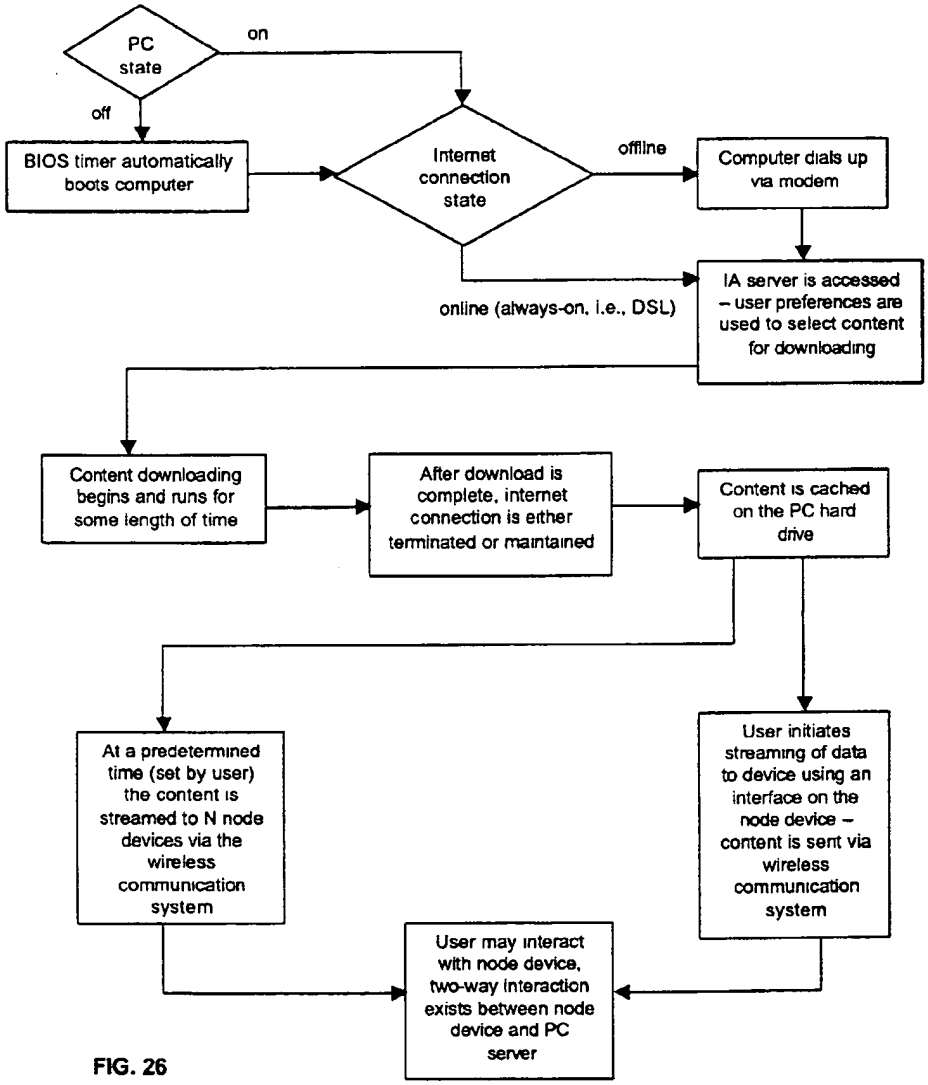

PC state
on
off
BIOS timer automatically boots computer
Internet connection state
offline
Computer dials up via modem
online (always-on, i.e., DSL)
IA server is accessed – user preferences are used to select content for downloading
Content downloading begins and runs for some length of time
After download is complete, internet connection is either terminated or maintained
Content is cached on the PC hard drive
At a predetermined time (set by user) the content is streamed to N node devices via the wireless communication system
User initiates streaming of data to device using an interface on the node device – content is sent via wireless communication system
User may interact with node device, two-way interaction exists between node device and PC server

FIG. 26

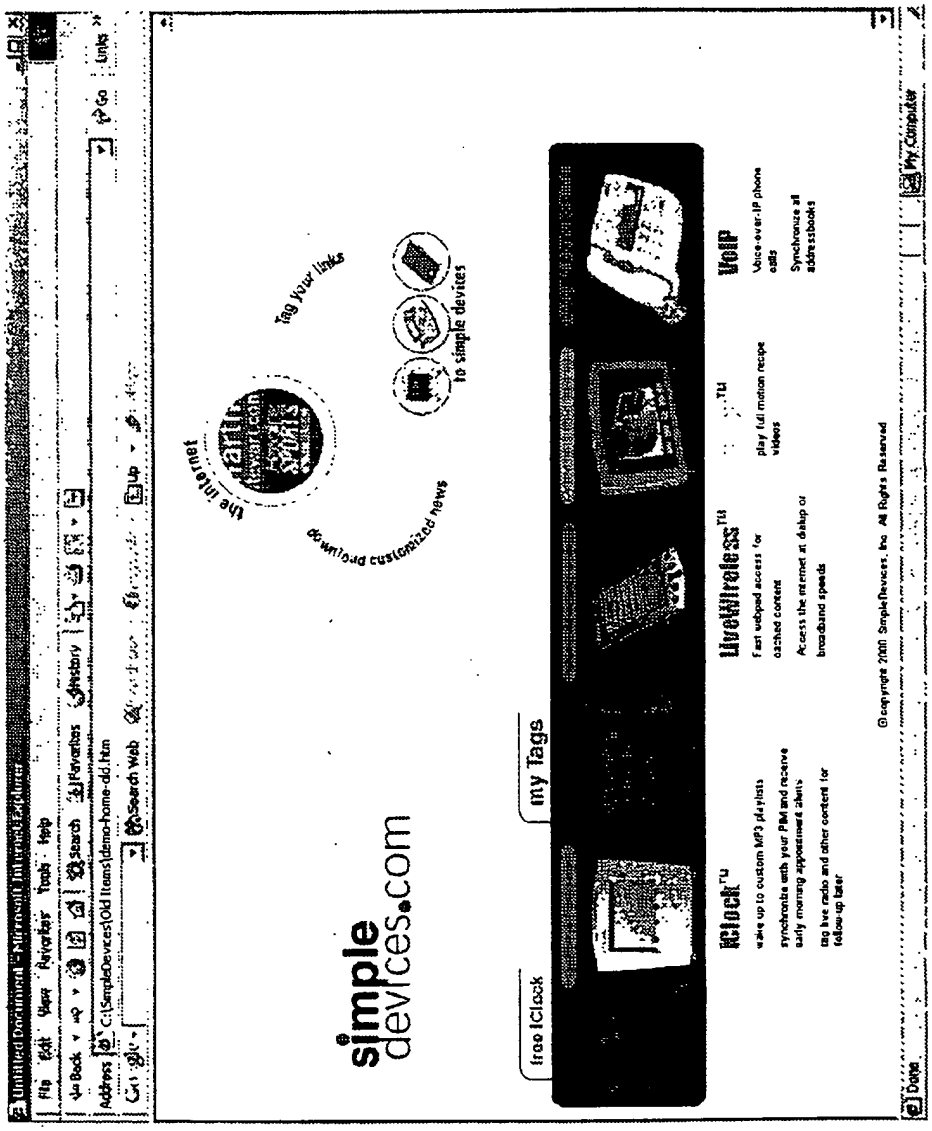

simple devices.com
my Tags
free iClock
iClock™
LiveWireless™
VoIP
tag your links
to simple devices
the internet
download customized news

FIG. 27

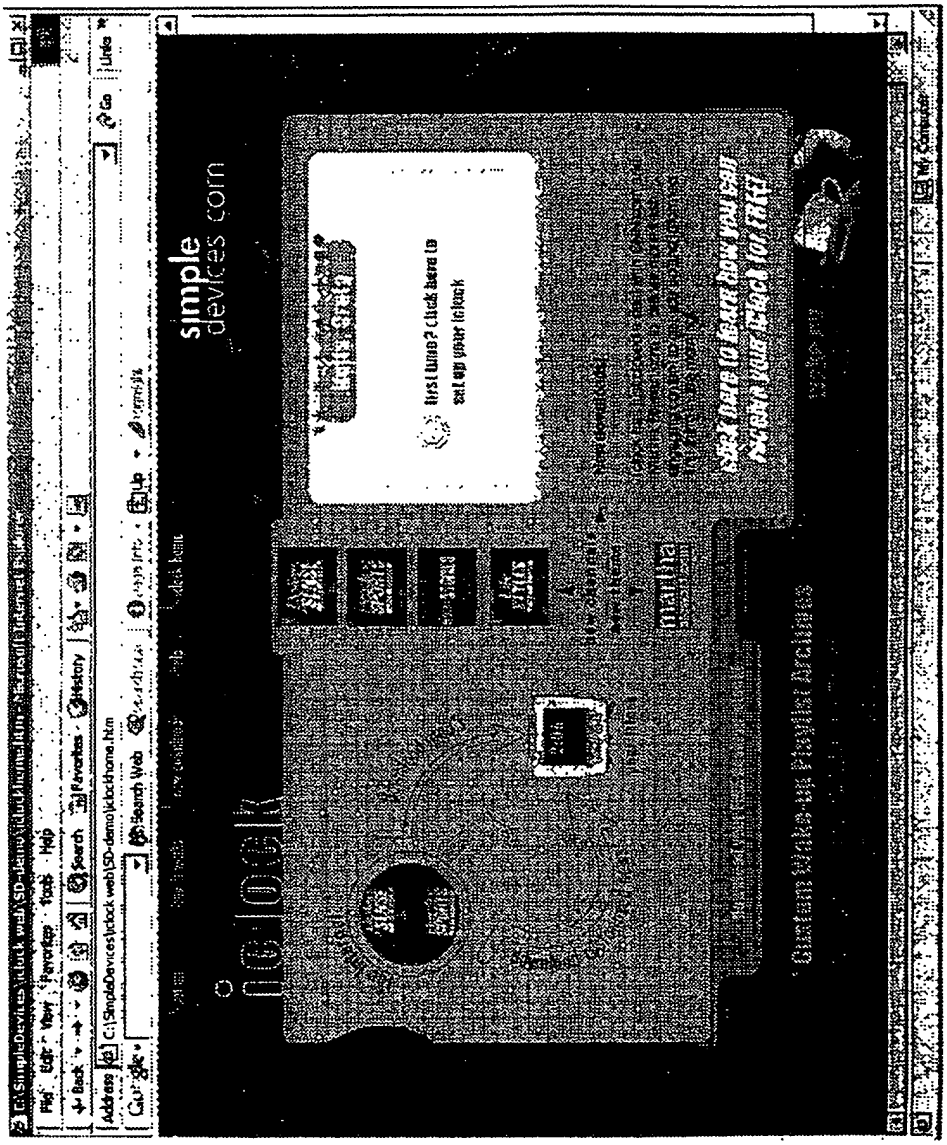


FIG. 28

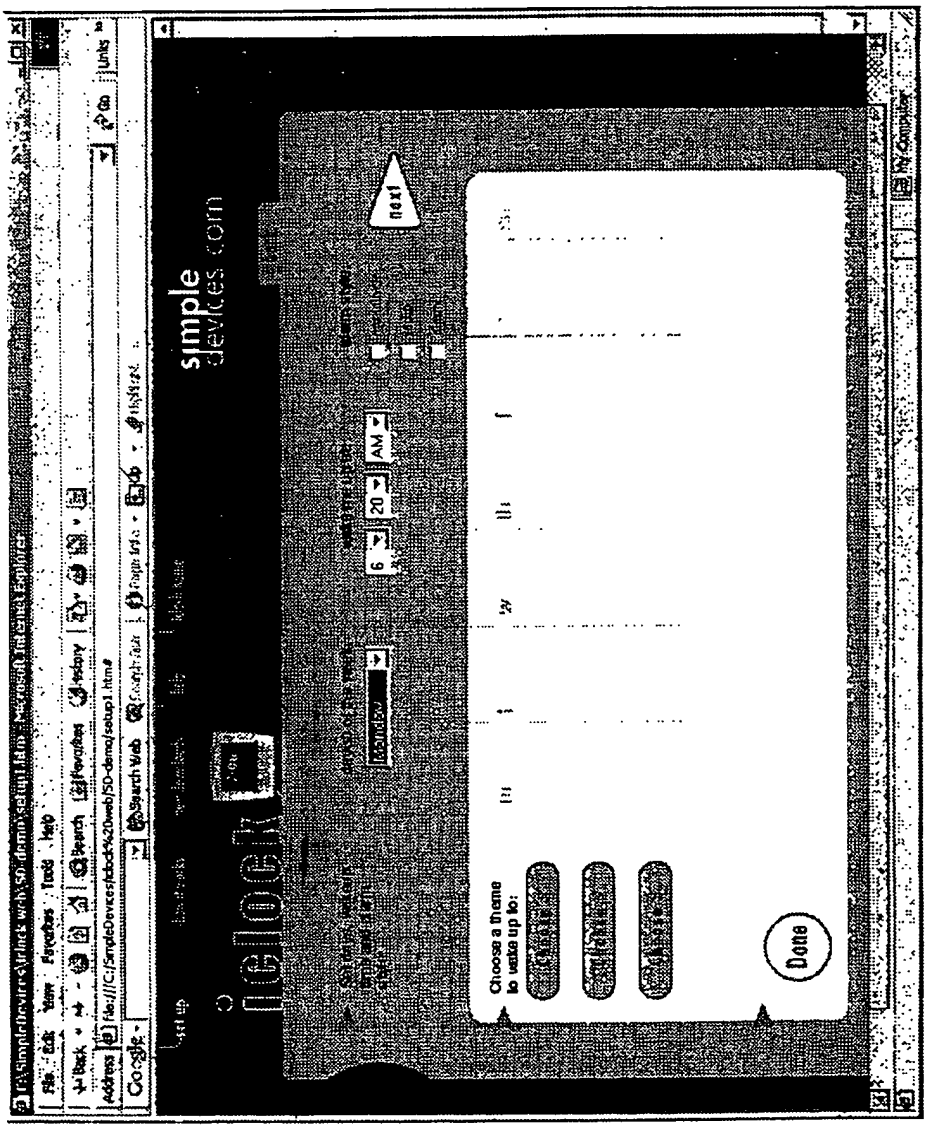


FIG. 29

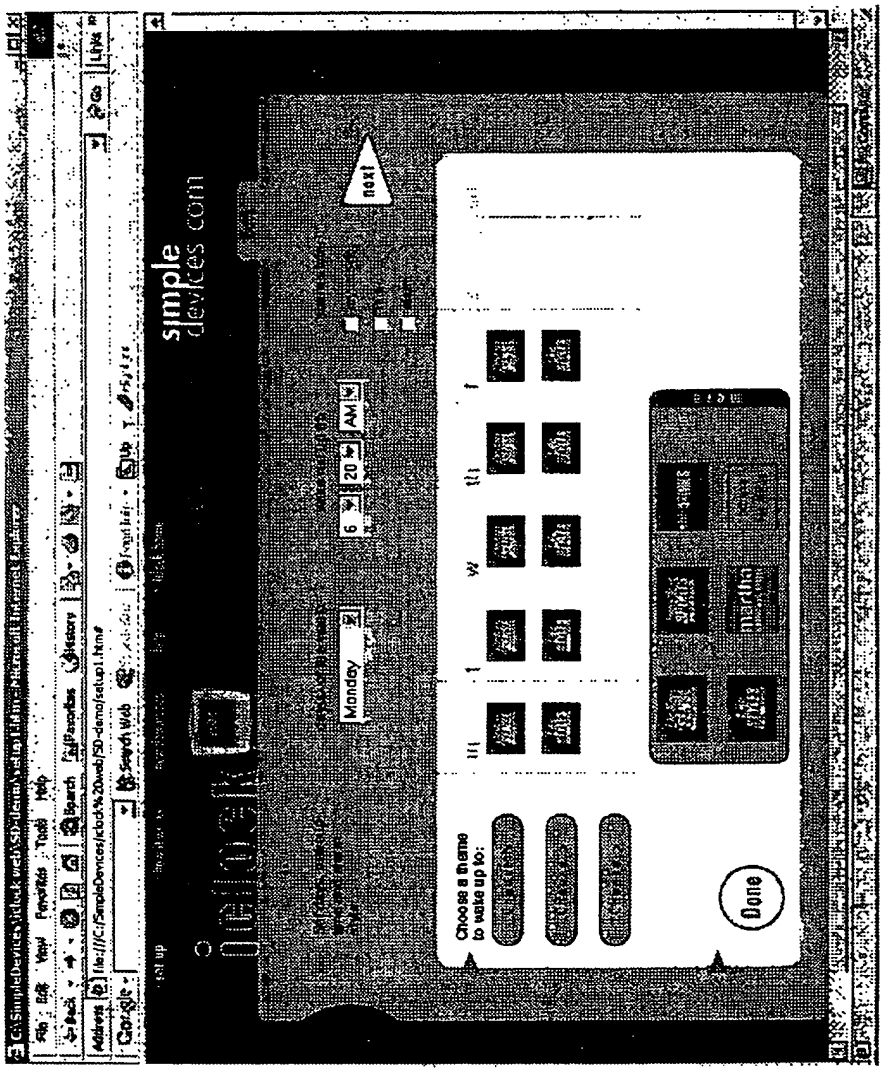

simple devices.com
next
Monday
AM
Choose a name to wake up to:
Done

FIG. 30

SYSTEM FOR PROVIDING CONTENT, MANAGEMENT, AND INTERACTIVITY FOR THIN CLIENT DEVICES

[0001] This application claims the benefit of U.S. Provisional Application No. 60/199,638, filed Apr. 25, 2000, entitled System for Presenting Data and Content from the Internet on Client Devices; and No. 60/268,434, filed Feb. 12, 2001, entitled System for Delivering Content to Client Devices.

FIELD OF THE INVENTION

[0002] A system is disclosed for providing user specified channels for moving content from the Internet and local storage device to one or more networked devices for access by end users. More specifically, content and data is delivered to a variety of devices via a caching gateway device and a local area network. Software residing on a PC or PC in combination with a storage gateway device provides content distribution, management, and interaction functions.

DEFINITIONS

[0003] Web, world wide web, and Internet are used here interchangeably, and are defined as the sum total of all connected computers on the planet, the connection being via standardized digital communications protocols, such as TCP-IP and HTTP and the like, including wirelessly linked devices that may use other protocols.

[0004] Broadband connection is defined as a communications network in which the frequency bandwidth can be divided and shared by multiple simultaneous signals. A broadband connection to the Internet typically provides minimum upstream and downstream data-rates of approximately 200K or more bits per second. There are many different types of broadband connections including DSL, cable modems, and fixed and mobile wireless connections.

[0005] A DOCSIS (Data Over Cable System Interface Specification) modem is an industry standard type of cable modem that is used to provide broadband access to the Internet over a coaxial cable physical layer that is also used for the delivery of cable TV signals (CATV). DOCSIS modems are well known in the telecommunications industry and will not be described here in detail.

[0006] A DSL (Digital Subscriber Line) modem is also an industry standard type of modem that is used to provide broadband access to the Internet, but over conventional copper phone lines (local loops). DSL modems are well known in the telecommunications industry and will not be described here in further detail.

[0007] The term gateway, used interchangeably with broadband gateway, is defined as an integral modem and router, and may include hub functionality. The modem function is used to change voltage fluctuations on an input carrier line (a DSL line input or a cable TV input) into digital data. Modems (modulator/demodulator) are a well-known technology in the telecommunications market and will not be addressed in detail here. Routers are devices that connect one distinct network to another by passing only certain IP addresses that are targeted for specific networks. Hubs allow one network signal input to be split and thus sent to many devices. Routers and hubs are well known technologies in the network and telecommunications industry so they will not be described here in detail.

[0008] Gateway storage peripheral is defined as an add-on storage device with processing power, an operating system, and a software application that manages the downloading and storage of data. An example scenario for the use of a gateway storage peripheral is a system where a user has a DOCSIS modem and would like to add an always-on storage capability. The gateway storage peripheral is connected to the DOCSIS modem via a USB port or an Ethernet port in the DOCSIS modem. USB disks are well known in the computer storage peripheral industry, and are available for purchase. A gateway storage peripheral in combination with a DOCSIS modem or any type of broadband modem is considered a storage gateway system. A PC that is always left on and connected to an always-on gateway with a DSL or broadband cable connection is considered a storage gateway system.

[0009] The term "message" is defined as information that is sent digitally from one computing device to another for various purposes. The term "content" is used to mean the information contained in digital files or streams that is meaningful, relevant, and desired, by end-users. For example, content is entertainment or news, that is, information that was for the most part created by entities other than the end-user, or for example, audio files in MP3 format. "Data" is used to mean information created by end-users such as digital schedule contents, responses from devices sent back through the system, or digital messages and email. "Content" and "data" are sometimes used interchangeably.

[0010] Local Area Network (LAN) is defined as a network structure that includes two or more devices that can communicate with other devices utilizing a shared communication infrastructure, including wired network technologies, such as Ethernet, or wireless network technologies such as 802.11b or HomeRF technology. Wireless LAN technology such as 802.11b and HomeRF are based on the unlicensed 2.4 Ghz ISM (Industrial, Scientific, and Medical) frequency band and are well known the telecommunications and LAN industries. These networking technologies utilize Transmission Control Protocol/Internet Protocols (hereafter TCP/IP) protocols. Since these protocols and these technologies are well known, they will not be addressed here in detail. A LAN typically constitutes a group of interconnected devices that share a common geographic location and are typically grouped together as a subnet. A local network for example would be a home network where several computers and other smart devices, such as the Internet clock (described below), would be digitally connected for the purpose of transferring content and data, controlling each other, sharing programming, or presenting data and content to an end user.

[0011] Codec (Compression/Decompression algorithm) is a software application that is used to decode (uncompress) encoded (compressed) media files or streams. Most content is stored and sent in a compressed format so that the content files are smaller and thus take up less storage space and use less bandwidth when being transferred via the Internet. The content is then decoded at the playback device. For example, MP3 audio files are encoded and must be decoded by a microprocessor running the codec in order for the audio content to be presented to the user in an analog format.

Codecs for both video and audio are a well-known field of digital media technology and will not described here in detail.

[0012] HTTP is Hyper-text transfer protocol, the protocol used by Web browsers and Web servers to transfer files, such as text and graphic files. Data-rate is defined as the data throughput of a telecommunications system or technology, and is measured in a quantity of bits per second, such as millions of bits per second (Mbps).

BACKGROUND AND DESCRIPTION OF PRIOR ART

[0013] The rapid buildup of telecommunications infrastructure combined with substantial investment in Internet-based businesses and technology has brought Internet connectivity to a large segment of the population. Recent market statistics show that a majority of households in the U.S. own at least one personal computer (PC), and a significant number of these PCs are connected to the Internet. Many households include two or more PCs, as well as various PC productivity peripherals such as printers, scanners, and the like. Decreases in the cost of PC components such as microprocessors, hard disk drives, memory, and displays, have driven the commoditization of PCs. Although the majority of household PCs are connected to the Internet by dialup modem connections, broadband connectivity is being rapidly adopted, and is decreasing in price as a variety of technologies are introduced and compete in the marketplace. A large majority of households in the U.S. and Europe is viable for at least one or more type of broadband connection, such as cable, DSL, optical networks, fixed wireless, or two-way satellite transmission.

[0014] A market for home networking technology has emerged, driven by the need to share an Internet connection between two or more PCs, and to connect all the PCs to productivity peripherals. There has been innovation in LAN technology based on end-user desire for simplicity and ease of installation. Installing Ethernet cable is impractical for a majority of end-users, therefore a number of no-new-wires technologies have been introduced. The Home Phoneline Networking Association (HPNA) promotes networking products that turn existing phone wiring in the home into an Ethernet physical layer. Adapters are required that allow each device to plug into any RJ-11 phone jack in the home. The adapter modifies the signal from devices so that it can be carried by the home phone lines. Existing HPNA products provide data-rates equivalent to 10base-T Ethernet, approximately 10 Mbps. Networking technology that uses the AC power wiring in the home to carry data signals has also appeared, notably from Intellon Corporation, of Ocala, Florida. Similar to HPNA devices, adapters are required to convert data signals from devices into voltage fluctuations carried on to and off of the AC wires, allowing any AC outlet to become a network interface. Although both HPNA and power line networking products are convenient to use because they require no new wires, the advantage of AC power line products over HPNA is that AC power outlets are more ubiquitous than RJ-11 phone jacks.

[0015] Wireless radio-frequency (RF) LAN technology has also been introduced into the home networking market. Theoretically, wireless technology is the most convenient for the end user to install. There are currently two prevalent standards for wireless networking, 802.11b and HomeRF. Both of these systems utilize the unlicensed 2.4 Ghz ISM band as the carrier frequency for the transmission of data. Both of these technologies have effective ranges of approximately 150 feet in a typical household setting. 802.11b is a direct sequence spread spectrum technology, and is provided by a variety of telecommunication OEMs such as Lucent Corporation of Murray Hill, New Jersey. HomeRF is a frequency-hopping spread spectrum technology and is also provided by a variety of telecommunications OEMs such as Proxim, Inc., of Sunnyvale, Calif. Adapters that are RF transceivers are required for each device to communicate on the network. In addition to utilizing TCP/IP protocols, each of 802.11b and HomeRF include additional encryption and security protocol layers so that the user's devices have controlled access to data being sent through the LAN.

[0016] Due to market competition and the effect of Moore's Law, home networking technology is greatly increasing in performance and availability, while decreasing in price. For example, the current data-rate roadmap shows HomeRF increasing from 10 Mbps to 20 Mbps, utilizing the 5 Ghz band. The 802.11 technology roadmap shows the introduction of 802.11a at 54 Mbps, also utilizing the 5 Ghz band. It is important to note that LAN data-rates are increasing much faster than wide-area data-rates, such as the data-rates provided by "last mile" technologies including DSL, DOCSIS. Wireless wide area data-rates are also improving slowly. Current digital cellular technology provides less than 64 Kbps data-rates, with most systems providing throughput in the 20 Kbps range.

[0017] While networked PCs with Internet connectivity provide greater convenience for productivity applications, there are other trends that are influencing end user's content experiencing habits. For example, Personal Video Recorders (hereafter PVRs), such as the technology provided by Tivo, of Santa Clara, Calif., are increasing in popularity. These devices are an improvement on VCR "time-shifting" functionality, allowing users to record, pause, and start live broadcast media, almost in real time. These devices digitize terrestrially broadcast television content and store the files on a hard disk drive, providing much faster random access, fast-forwarding, and rewinding. A graphical user interface is provided that allows users to make content preference selections. A PVR supports the trend toward user controlled "anytime" access to digital content.

[0018] The MP3 digital audio format is an audio encoding technology that allows consumers to further compress digital audio files such as those found on Compact Disks, to much smaller sizes with very little decrease in sound quality. The MP3 format is the audio layer of MPEG-2 digital audio and video compression and transmission standard. For example, the MP3 format allows for compression of audio content to approximately 1 million bytes per minute of audio, at near Compact Disk quality. This capability, combined with a decrease in the cost of flash memory, a type of non-volatile silicon-based mass memory, has made it possible to develop affordable, portable digital audio playback devices. These are devices that are significantly smaller than portable CD players because they contain no moving parts, only flash memory and a microprocessor for decoding MP3 compressed audio content.

[0019] PC-based MP3 software players have been created that provide a convenient graphical user interface and soft-

ware decoding of MP3 files. The most popular player is the Winamp player, is provided by American Online/Time Warner. Winamp allows users to play MP3 files on their PC, using an existing sound card with external speakers. However, to listen to MP3 s the user must interface with the PC, using a mouse and keyboard, and must be nearby the PC sound output equipment.

[0020] The smaller size of MP3 encoded audio files has also enabled these files to be shared by users across the Internet, since the transfer of these files takes an acceptable amount of time. Internet-based digital music access and distribution service businesses have appeared, such as MP3.com and Napster.com, that provide various means for users to gain access to digital audio files.

[0021] In addition to music, many other types of audio content are now available in digital format, such as spoken-word content, news, commentary, and educational content. Audible.com is an Internet-based repository of digital spoken-word content. Digital files containing audio recordings of books being read aloud are available for download directly from their website.

[0022] Graphic content such as video and still images are also increasingly available. Digital still and video cameras allow the capture and rapid transfer of images. The Ceiva Picture Frame, provided by Ceiva Logic, of Los Angeles, Calif., is a product that allows users to share digital images across the Internet. The Ceiva Picture Frame is comprised of a frame housing similar to a conventional picture frame, but with a large LCD in place of a photograph. The device includes a microprocessor, memory, and modem. The device must be plugged into a phone line, and it functions by automatically dialing-up to a server where new digital images are stored. Based on user instructions made through a setup function on a website, a group of photos are sent to, and stored on, and displayed by the device. The Ceiva Picture Frame is a costly item due to the fact that it includes a large LCD, and also because it must include enough memory to store the digital images. However, the Ceiva Picture Frame is an example of digital content delivered beyond the PC.

[0023] Internet access is also available through the use of wireless phones with Internet browsing capability and Personal Digital Assistants (hereafter PDAs) with wide-area wireless connections, such as the Palm VII, provided by Palm Computing of Santa Clara, Calif., or a Palm V with an OmniSky wireless modem, provided by OmniSky Corporation of San Francisco, Calif. The Palm VII uses the paging network, which provides among the lowest bandwidth connection available at approximately 2.4 Kbps. The OmniSky product uses the cellular wireless infrastructure which provides a maximum of 19.2 Kbps. Many wireless cellular phones now provide "wireless web" limited browsing capability. The slow data-rates provided by these products, as well as limited display area and awkward methods of user interaction, have resulted in slow adoption rates, and signals that users increasingly demand rich media experiences that can only be supported by broadband data-rates. Additionally, use of these products supports the trend of access to Internet content beyond the PC.

[0024] AvantGo, Inc. of San Mateo Calif. provides software that channels content from the Internet to a Palm Pilot handheld device through a PC with an Internet connection. The Palm Pilot must be docked in its cradle for the transfer to take place. The personal computer is used mainly as a communication link, as none of the content is stored on the computer, it passes through the PC and is stored on the Palm Pilot. The user removes the Palm Pilot from the cradle and then accesses the information from the last download on the Pilot. The AvantGo system does not provide for rich media experiences as the Palm Pilot is limited in its processing power and Palm Pilot does not leverage the processing power of the personal computer. Although the Palm Pilot with the AvantGo service is not a real-time Internet device, it does further support the trend of access to Internet content beyond the PC.

[0025] Cable, as well as satellite TV services are efficient in providing video content to a wide variety of users. However, most existing cable and satellite systems provide video delivery services on a broadcast model, that is, customers must choose from a set number of audio/video programs that are simultaneously broadcast, with the schedule determined by the broadcast networks. With the overlaying of data services over existing cable lines, there is the opportunity to provide a video-on-demand service whereby customers could order video programming of their choice at any time. However, a simple calculation will show that pure video-on-demand cannot be supported by the bandwidth available on the existing networks, due to the high data-rates required to transport high-quality video and audio in real-time.

[0026] The convergence of the digitization of content, combined with the proliferation and decreasing cost of networking and data processing components, is providing the opportunity to deliver rich content via the Internet, to a variety of inexpensive devices beyond the personal computer. What is required is a system that provides an economically optimal architecture and management system for allowing users to set up preferences for content of varying types, including rich content, and other services, to be automatically delivered to inexpensive client devices.

SUMMARY OF THE INVENTION

[0027] The present invention exemplifies the new and unobvious art of a system for delivering content, data, and application services to a variety of thin client devices. Briefly and generally, the system is used to provide a means for end users to program preference-based content for delivery at various client devices, and then to automatically or under the control of the user, send the content to client devices for presentation to the end user. Content from the Internet or otherwise digital content is accessed and cached locally in a server in the home or enterprise, so that wide area network bandwidth is optimized. The cached content is sent to thin client devices via a LAN communication link that is much faster than the wide area link, resulting in rich media experiences for the end user. The system also provides for inexpensive thin client devices, because the long term mass storage of content and data, and the processing of GUI instruction occurs at the local PC and/or storage gateway. The system for delivering content and services to thin client devices disclosed herein provides for a low total cost of delivering content beyond the PC, while insuring a high quality experience for the user in terms of audio and video quality, and simple interaction.

[0028] Objects and Advantages

[0029] Further objects and advantages of the present invention are as follows:

[0030] (a) to provide a system where content delivery devices can be lower in cost due to the fact that mass storage, large displays, and the majority of device setup is offloaded to the PC or PC and caching gateway.

[0031] (b) to provide high-bandwidth content delivery with a very low overall system cost.

[0032] (c) to provide a system that optimizes the usage of broadband bandwidth, due to the fact that content can be sent to the local caching device during times when bandwidth is least expensive, such as in the middle of the night or during midday.

[0033] (d) to provide a simple system for sending Internet content to client devices beyond the PC.

[0034] (e) to provide a system that provides economically efficient content delivery by utilizing un-used processing power and storage capacity in a user's PCs.

[0035] (f) to provide a means for configuring content and operational preferences for a thin client device that receives Internet content, by using the convenient and optimized interface available at a PC.

[0036] (g) to provide a device with valuable real-time interactivity with a simple, low-cost human interface.

[0037] (h) to provide a convenient drag-and-drop graphical user interface that allows users to make content selections using a web page and a local application.

[0038] (i) to provide a system whereby content that is specifically preferred by an end user is automatically retrieved and stored on a local storage device for delivery at a pre-scheduled time or regularly scheduled interval.

[0039] (j) to provide a system that allows single button activation interactivity by the end user.

[0040] (k) to provide a system that allows users to gain access to information related to content they experience on thin client devices while engaged in other activities that make browsing at the very moment of experiencing the content impractical or inconvenient.

LIST OF DRAWING FIGURES

[0041] **FIG. 1**. shows a block diagram of the system at the highest level.

[0042] **FIG. 2**. shows a block diagram of the system control application.

[0043] **FIG. 3**. shows an example console GUI on the PC desktop.

[0044] **FIG. 4**. shows the web-based content guide GUI window and the audio device content editor GUI on a PC display desktop window.

[0045] **FIG. 5**. shows the web-based content guide GUI window and the audio device content editor GUI after a content object has been dragged and placed.

[0046] **FIG. 6**. shows the web-based content guide GUI window and the audio device content editor GUI with a dialog box launched.

[0047] **FIG. 7**. shows the web-based content guide GUI window and the audio device content editor GUI with the "new playlist" text box open.

[0048] **FIG. 8**. shows the web-based content guide GUI window and the Internet clock content editor GUI.

[0049] **FIG. 9**. shows the web-based content guide GUI window and the Internet clock content GUI after a content module has been dragged and placed.

[0050] **FIG. 10**. shows the web-based content guide GUI window and the Internet clock content GUI after a content module has been expanded from "Monday" to "Friday".

[0051] **FIG. 11**. shows the web-based content guide GUI window and the Internet clock content GUI and the softkey assignment pop-up menu.

[0052] **FIG. 12**. is an isometric view of the audio playback device.

[0053] **FIG. 13**. is an isometric view of the Internet clock.

[0054] **FIG. 14**. shows a tag aggregation web page.

[0055] **FIG. 15**. shows a PC desktop with the console and the audio device controller.

[0056] **FIG. 16**. shows a PC desktop with the console and the Internet clock controller.

[0057] **FIG. 17**. shows a functional block diagram of a storage gateway.

[0058] **FIG. 18**. shows a digital image editor GUI.

[0059] **FIG. 19**. shows a block diagram of the audio playback device/stereo system.

[0060] **FIG. 20**. shows the audio playback device with the remote control removed.

[0061] **FIG. 21**. is a block diagram of the tag response sequence.

[0062] **FIG. 22**. shows a PC desktop with a content preference selection web page.

[0063] **FIG. 23**. shows a system block diagram including a storage gateway peripheral.

[0064] **FIG. 24**. is a home PC storage server setup flowchart.

[0065] **FIG. 25**. is a flowchart showing the process of programming client device content on a website.

[0066] **FIG. 26**. is a home PC storage server operation sequence.

[0067] **FIG. 27**. is an image of a webpage for selecting the client device to program.

[0068] **FIG. 28**. is an image of webpage which is a first setup page for an Internet clock.

[0069] **FIG. 29**. is an image of a webpage for programming the content for an Internet clock.

[0070] **FIG. 30**. is an image of a webpage showing the results of a users selection of content for an Internet clock.

DESCRIPTION OF PREFERRED EMBODIMENT

[0071] First a description of the various components of the system is provided, then a description of the three functional modes. It should be noted that the functionality of the software and hardware pertinent to the invention disclosed in this document is described at several levels including at the interface level (what the end user sees and experiences) and at the action level (software and hardware interactions involving digital messages, content, and data). It is assumed that software engineers of reasonable ability would be able to program the functions described here using common programming languages and tools such as C, C++and Java programming languages, and Microsoft Foundation Classes (MFC), and other tools and development systems for other operating system such as VxWorks and Linux. Details of the software architecture are given when it is deemed to aid in the complete disclosure of the system.

[0072] The system disclosed herein provides a communication connection and a content and data management system comprised of software and hardware on three different computing platforms: (1) the Internet **8**, (2) a local PC **34** or PC **34** and a storage gateway **38**, and (3) the local client devices **78***a, b, c,* and *d*. **FIG. 1** shows a schematic of the invention disclosed here. PC **34** is a conventional computer including a microprocessor, system memory, hard disk drive **30**, display, keyboard, and mouse, and runs the Windows operating system, provide by Microsoft of Redmond, Oreg. PC **34** also includes a Universal Serial Bus (hereafter USB) port for connecting peripheral devices. PC **34** is connected to content and data **10** on Internet **8** via a wide area network broadband communication link **14** that provides data delivery rates ranging from 500 kbps to 3,000 kbps. Broadband communication link **14** is well known in the telecommunications and computer industry, thus the connection technology will not be described in greater detail. In the preferred embodiment, broadband connection **14** is maintained by DOCSIS storage gateway **38**. **FIG. 17** shows a block diagram of the functional hardware and software components of storage gateway **38**. Hard disk drive **30** is combined with a conventional DOCSIS cable modem and a HomeRF LAN transceiver **50**. These subsystems are controlled by a computer comprised of a microprocessor **280**, and the SDRAM **284** running an operating system, such as VxWorks provided by WindRiver Systems of Alameda, Calif. The core module **42** software application described below, runs on and functionally connects storage gateway **38** to the other system components.

[0073] Referring again to **FIG. 1**, in the preferred embodiment, the high-speed LAN connection **70** between PC **34**, storage gateway **38**, and devices **78**, is a HomeRF wireless network. The communications protocol between PC **34** and Internet **8** is HTTP and TCP/IP. The GUI module **46** software aspect of system control application **18** exists on PC **34**. In the preferred embodiment, core module **38** aspect of system control application **18** exists and is run on both storage gateway **38** and on PC **34**. The communication message structure between client devices **78** and PC **34** and storage gateway **38** are XML formatted messages **74** sent over HTTP. Web Content Guide Referring again to **FIG. 1**, content and data **10** on Internet **8** is expressed on web pages as an organization of text and graphical information, some of which is configured as interactive hyperlinks, all of which are formatted using HTML for presentation to end user's PCs **34** via HTTP communication protocols. A content selection web page **22** is shown in **FIG. 4** through **FIG. 11**. The graphical interactive representation of the portal to the end user is as a series of hyper-linked web pages and hyper-linked text and images. The physical manifestation of the portal is that of software and data stored on servers located at various and disparate physical locations, but connected by Internet **8**.

[0074] Content **10** on Internet **8** is arranged for delivery to local client devices **78***a, b, c,* and *d* by a system that allows for graphical icons, referred to in this disclosure as content objects **20**, that exist on content selection web page **22**, to be dragged and dropped onto content editors on a PC **34**. Drag and droppable content object **20** is a graphical representation of a file system path that points to a digital content file stored locally on hard disk drive **30** on PC **34** or on storage gateway **38**, or on a server on Internet **8**, or is the graphical designation of a URL or IP address and port number of an digital content stream originating on a server on Internet **8**. The purpose of the portal is to simplify and facilitate the discovery and selection of content **10** from Internet **8** for later use on client devices **78**.

[0075] Content selection web page **22** capability may include, but is not limited to the following functionality:

[0076] 1) Presentation and organization of content and or links to content according to file type (e.g. MP3, MPEG, and the like), and or according to genre (e.g. music or video).

[0077] 2) Further sub classification of content within file types or genres. For example a "music" category may be further divided into additional classifications such as "classical", "jazz", "pop", "internet radio" and the like.

[0078] 3) Additional information that is relevant to content links. For example, a song link may be displayed with information about the artist and or reviews and links to further information such as lyrics, artist concert schedule, and the like.

[0079] 4) A means for searching for particular content on the web portal and or its affiliate links.

[0080] 5) A means for retaining user preference information for the purpose of customizing the web portal content according to the users preferences.

[0081] Content **10** from Internet **8** that may be used in the system disclosed here may be selected from a wide range of content selection web pages **22**, that may be formatted differently, and may be available from many different content creators and content aggregators. Content creators include for example the music labels, such as EMI or BMG, both of New York, N.Y., that is, firms whose business it is to create or commission to create, and own content. Content aggregators are firms whose business it is to collect certain types of content, such as digital music, for the purpose of

enabling ease of selection by end users and distribution. Examples of content aggregators are MP3.com, or Listen-.com.

[0082] The capability for determining and aggregating the content objects **20** presented to a specific user on content selection web pages **22** are derived from content preferences selections provided by the user. For example, referring now to **FIG. 22** a content preference selection web page **24** is shown with content selection check boxes **42** beside content selection labels **46** that describe a variety of content choices. The user uses the mouse to click on the boxes next to desired content types, as shown in **FIG. 22**. Thereafter upon returning to content selection web page **22**, only content objects **20** that relate to the selected content types are displayed to the user. Functionally, content selection labels **46** are graphical representations of HTML links to actual content files, such as digital audio or digital video files. These links are organized and stored in a content link database **126** on content link database server **130**. The actual content files to which content selection labels **46** refer are stored at the content creator's or content aggregator's servers.

[0083] System Control Application

[0084] Referring now to **FIG. 1** and **2**, a system control application **18** is comprised of two sub-applications, the core module **42** and the Graphical User Interface (hereafter GUI) module **46**. In the preferred embodiment, core module **42** is implemented as a multi-threaded Java application with instances running on both PC **34** and storage gateway **38**. A Windows version of a Java Virtual Machine (JVM) resides and runs on PC **34** and interprets core module **42** instructions for the Windows operating system. Likewise, a VxWorks version of JVM interprets core module **42** instructions to VxWorks. GUI module **46** is implemented as a Win32 application and resides and runs on PC **34**. System control application **18** serves the function of managing the connection between content **10** and various servers on Internet **8**, and PC **34** and storage gateway **38**, and also manages the flow of information between PC **34** and storage gateway **38**, and client devices **78**.

[0085] Core module **42** and GUI module **46** access and modify the system control application database **96** using methods called over HTTP and expressed with XML grammar. System control application database **96** is a set of files that contain system parameters and data. For example, a track (song name) shown in audio device content editor **24** is referenced as a file name and a path designation a particular hard disk drive **30** on either of PC **34** or storage gateway **38**, in a listing in system control application database **96**. Actions that are taken, such as playing this file, are triggered by XML messages **74** sent from client devices **78** via LAN **70** or from GUI module **46** to core modules(s) **42** over HTTP.

[0086] The GUI module consists of segments of the software application that run the GUI, including, but not limited to, the following functions:

[0087] 1. Displaying GUI elements on a computer display for view by the end user.

[0088] 2. Acknowledging user responses made via mouse and keyboard, or other pointing and interaction devices.

[0089] 3. Allowing for manipulation of the GUI elements such as:

[0090] a. drag and drop **28** of content objects **20**

[0091] b. GUI button activations

[0092] c. text entry.

[0093] d. pull down menu and menu selections.

[0094] 4. Communication between GUI module **46** and core module **42**. The selections and control manipulations made by the end user are communicated to core module **42** where they can be acted upon.

[0095] 5. Launching of specific device content and control editors from a system console **16**, as shown initially in **FIG. 3**, described below.

[0096] Core module **42** consists of the portion of the system control application **18** that acts on content and data **10** from Internet **8** and also processes commands contained in messages sent from client devices **78**, providing, but not limited to, the following functions:

[0097] 1. Communication links:

[0098] a. Accessing content **10** on Internet **8** at a prescribed location as determined by user inputs into the GUI content editors such as audio device content editor **24** and Internet clock content editor **40**.

[0099] b. Accessing and communicating with GUI module **46**.

[0100] c. Accessing and communicating with client devices **78**.

[0101] 2. Managing the caching (local storage) of content **10** from Internet **8** or otherwise digital content files.

[0102] 3. Streaming of content **10** from Internet **8** to client devices **78** connected to PC **34** and storage gateway **38** via LAN **70**.

[0103] a. Managing and routing streaming digital content **10** from Internet **8** to client devices **78**.

[0104] b. Managing and routing streams of cached digital content **10** files on storage gateway **38** or PC **34** to the client devices **78**.

[0105] 4. Scheduling—time-based automation of the accessing, caching, and streaming of content **10** from Internet **8** at times prescribed by the user or at times derived by direction given by the user through the GUI content editors such as audio device content editor **24** and Internet clock content editor **40**. The scheduling function accesses time and date inputs associated with actions stored in system control application database **96** by GUI module. The scheduling function periodically compares these time and date entries with the current state of PC's **34** or storage gateway's **38** internal timer. When there is a match, the action is taken.

[0106] 5. Managing user responses at client devices **78**—messages are sent from client devices **78** to core module **42**, based on button activations at client devices **78**.

[0107] 6. Network Address Translation (NAT) and routing—certain client devices **78** must be connected to the Internet **8** in real time. Core module **42** acts to connect messages and streams from client devices **78** to Internet **8**, and from Internet **8** to the client devices **78**.

[0108] 7. Client device **78** Application/Software Delivery—Client device **78** application code can be stored at PC **34** or storage gateway **38** and delivered to client devices **78** on an as-needed basis. For example, if the network device is audio playback device **86** that must be able to decode a variety of different encoded audio streams, then a specific CODEC (sent as a BLOB—binary large object) can be delivered to audio playback device **86** via LAN **70** and installed into memory **212** immediately before a content stream requiring that specific CODEC. Many different types of applications can be delivered just-in-time to client devices **78**. The advantage of this feature is that is requires for example audio playback device **86** to have smaller quantities of non-volatile (flash) memory **216** and smaller quantities of volatile (SDRAM) memory **212**. Reprogramming or modifying the firmware **220** at client devices **78** is also made easier since the software is accessible at PC **34** or storage gateway **38**.

[0109] 8. Transcoding—Certain types of content will be received at PC **34** or storage gateway **38**, decoded, re-encoded using a different CODEC at PC **34**, and then streamed to client devices **78**.

[0110] 9. Auto-discovery—Client devices **78** connected to PC **34** via LAN **70** will automatically appear as a specific client device control bar **26** on console **16** located on PC **34** desktop **12**. One or more client device control bars **26** constitute console **16**, shown in **FIG. 3** through **FIG. 11**.

[0111] 10. Message Transactions—text or other content or data from the Internet **8** can be transferred and presented on display **170** and display **132** client devices **78**.

[0112] 11. Tag servicing—when a tag button **128** or tag button **188** is pressed on one of client devices **78**, time, data, and information pertaining to currently playing content is aggregated into a message and sent to tag storage and processing server **138**. Tag processing services included in core module **42** acquire information that is included in the message. Tagging is described in greater detail later in this document. Tag servicing includes a function where core module **42** periodically accesses a specific location on Internet **8** to acquire and store an accurate time and date.

[0113] 12. Synchronization—Data, such as user data and related information, such as an accurate time and date, must be synchronized across the three platforms (web, device, and local server). Core module **42** time and date data is thus synchronized with an external (absolute) standard.

[0114] 13. Mirroring—Users can specify that content selections they make using the device content editors are to be mirrored at various other devices. For example, a user may have audio playback device **86** and a car caching and playback device. The user can specify that they want content **10** from Internet **8** that is cached on storage gateway **38** in the home to be mirrored exactly in the car-based caching device. The end user can thereby access all of the exact same content **10** in the same playlist structure in both the home and in the automobile.

[0115] System control application **18** and system control application database **96** are designed to function with a number of instances of core module **42** and GUI module **46** running concurrently on multiple PCs **34** and or storage gateways **38**, all connected by the same LAN **70**. It is anticipated that users will own and operate multiple PCs **34** in a single home for example, with different content **10** cached on each PC **34**. However, for the purpose of simplicity in describing the basic functionality of the system, the preferred embodiment will focus will be on a singular GUI module located and executed on a PC.

[0116] Client Devices

[0117] Client devices **78** can take many physical forms but the common attribute is that it client devices **78** are nodes on LAN **70**, receiving digital content and data **10**, and instructions, from core module **42** subsystem of the system control application **18**, and sending back XML message **74** control instructions and data from interaction or data that originates at client devices **78**. In the preferred embodiment client devices **78** include webpad **92**, audio playback device **86**, Internet clock **82**, digital picture frame **100**, and automotive storage device **142**. Generally, client devices depend on LAN **70** connectivity to provide the majority of their functionality. Client devices **78** range widely in the amount of integral memory capability. For purposes of clarity, the preferred embodiment shows in detail how content is set up, organized, and scheduled for delivery to two media player devices: audio playback device **86** that is connected to a stereo receiver **114**, and Internet connected clock **82**. However, it should be clearly understood that the system is designed to function with a wide variety of networked client devices **78** and audio playback device **86** and Internet clock **82** are described as examples of how the system functions.

[0118] **FIG. 12** shows an isometric view of the audio playback device **86**. The purpose of audio playback device **86** is to functionally connect digital audio content from a remote digital audio source to an already existing conventional stereo system. Audio playback device **86** receives a stream of encoded audio content from PC **34** or storage gateway **38**, real-time decodes it in real-time, and converts the uncompressed digital information into analog electrical signals. Audio playback device **86** includes a plastic injection-molded main housing **168** that contains a printed-circuit board (PCB) **218**. PCB **218** electrically connects the components of a computer, comprised of a microprocessor **208** with dynamic memory (SDRAM) **212** and programmable (flash) memory **216**. Microprocessor **208** in combination with dynamic memory **212** executes instructions from its operating system and programming, referred to as the firmware **220** stored in programmable memory **216**. Audio playback device **86** also includes a wireless network interface sub-system **228** for communicating with PC **34** and storage gateway **38**, an infra-red (IR) control sub-system **146** for processing IR commands from the IR remote control **90**,

and a display **170** sub-system for presenting text and graphical information to the user. Audio playback device **86** also includes a digital-to-analog converter (DAC) **224** for converting the uncompressed digital information into analog signals that are presented at the standard left and right RCA connectors, **240** and **244**. Audio playback device **86** firmware **220** also includes a CODEC for decoding the audio file that is streamed to it from PC **34** or storage gateway **38**. In this embodiment, remote control **90** can be attached to audio playback device **86** front bezel **164**, as shown in **FIG. 12**. **FIG. 20** shows remote control **90** removed from the front bezel. **FIG. 19** is a block diagram showing how left analog output **240** and right analog output **244** included in audio content playback device **86** are connected respectively to the left line input **248** and right line input **252** on existing stereo receiver **114**. Stereo receiver **114** functions in the conventional way, pre-amplifying and amplifying the audio signals and delivering them to the left speaker **272** and the right speaker **276**. As shown in **FIG. 19**, audio playback device **86** also includes a terrestrial broadcast tuner subsystem **236** for tuning local AM and FM broadcast radio.

[0119] Audio playback device **86** remote control **90** includes button controls for the following functions: Power button **196**—for powering the device on and off; Source/User button **204**—for selecting the user (owner of playlists and corresponding tracks) or for selecting storage gateway **38**, PCs **34**, or terrestrial broadcast, from which content **10** from Internet **8** or other terrestrial content will be delivered; Playlist forward button **176** and playlist back button **172**—for advancing through and selecting playlists; Track forward button **184** and track backward button **180**—for advancing through and selecting tracks for playback; Play/Pause button **192**—for starting and pausing (stopping at point in the middle of a playback of an audio file); Stop button **200**—for stopping playback of audio content; Tag button **188**—for triggering the transmission of information about a currently playing track (file, Internet **8** stream, or terrestrial broadcast) back through the system for delivery to the end user on a website or for delivery to the content creator or content originator; User-defined button **206**—This button may be associated with a variety of functions as selected by the user using the audio playback device setup GUI.

[0120] The text descriptors associated with the playlists and associated tracks are sent to audio playback device **86** when requests are made by button activations. For example, if the user activates forward playlist button **176**, the text string for the next playlist after the one that is currently being played is sent to audio playback device **86** via LAN **70**, is processed, and the text is displayed on display **170**. Likewise if forward-track button **184** is activated, the text string that is the name of the next sequential file from the current playlist stored in system control application database **96** located on storage gateway **38** or PC **34**, is sent by core module **38** to audio playback device **86**, where the text string is displayed on display **170**. If play button **192** is then activated, the currently playing track is halted and the track that is being displayed is sent, decoded, and played through the stereo system. The functional interface to the user of audio playback device **86** is similar to that found on a typical CD changer, where the CD represents the playlist, and the tracks on the CD represent the tracks in the playlist.

[0121] **FIG. 13** shows an isometric view of Internet clock **82**. Internet clock **82**, is similarly comprised of a plastic injection-molded main housing **122** with a microprocessor **156**, dynamic memory **140**, non-volatile memory **144**, TFT display **132**, and operating system and firmware **146** programming. Display **132** on Internet clock **82** in the preferred embodiment is a large TFT graphics LCD, capable of showing images with 8-bit color. The control buttons or dials on Internet clock **82** include the following:

[0122] 1. The Softkey buttons **124***a, b, c, d,* and *e*, along-side display **132** that are labeled by graphics on display **132**. Softkey buttons **124***a-e* can be used as presets to allow the user to jump to content presentations that are associated with each button by a GUI pull-down menu **52** on Internet clock content editor **40**, as shown in **FIG. 11**.

[0123] 2. Volume dial

[0124] 3. Snooze button **120** (on/off)

[0125] 4. Source select (terrestrial radio, Internet **8** content)

[0126] 5. The Tag Button **128**—for triggering the transmission of information about a currently playing track (file, Internet **8** stream, or terrestrial broadcast) back through the system for presentation to the end user on tag aggregation web page **56**, or for delivery to the content creator or content originator.

[0127] Internet clock **82** includes microprocessor **156** and memory **140** sufficient to receive and decode a full-motion video stream. Internet clock **82** also contains an integral sound system consisting of an amplifier and speakers **136**. Therefore Internet clock **82** is capable of presenting audio, video, and interactive multimedia. The digital electronics and packaging technology for such a devices is well known in the consumer electronics industry, so it will not be described in greater detail.

[0128] Preferred Embodiment—Use of the System

[0129] There are three functional modes: (1) setup, (2) real-time user controlled content/data delivery, and (3) automatic content/data delivery.

[0130] The setup functions provide the user with the ability to organize and manage content that is to be sent to a device. Content **10** may be stored or generated on Internet **8**, or may exist on a local storage device, such on the PC's **34** hard disk drive **30**, or on storage gateway **38**. This content is organized and managed with the use of device content editors that are an aspect of GUI module **46** of system control application **18**.

[0131] A content editor is a part of GUI module **46** and is used for managing and manipulating content **10** that will be sent to networked client device **78**. The preferred embodiment will describe audio device content editor **24**, used to program and control content **10** for audio playback device **86**; and Internet clock content editor **40**, used to program and control content for Internet clock **82**. Content editors are launched from console **16**. This action is explained later in this disclosure.

[0132] Audio device content editor **24** provides the user with the ability to group audio files (tracks) into user-defined playlists, which are text association that contains a list of and paths to audio files or the URLs or IP addresses of audio streams, and are stored in system control application data-

base **96**. For example, a user may create a playlist called "Classical Music" that contains ten Beethoven symphonies. A common type of audio file format is the MP3 (MPEG layer 3) format. Certain tracks such as MP3 music files are stored on hard disk drive **30** on PC **34**, while other tracks such as streamed Internet **8** radio, are stored as URLS or IP addresses. Streamed media can be in a variety of formats. A popular format is in the Windows Media format, created by Microsoft Corporation of Redmond, Oreg. The audio device content editor **24** capability includes, but is not limited to, the following functionality:

[0133] 1. Display playlists

[0134] 2. Display tracks in a playlist

[0135] 3. Create a new playlist

[0136] 4. Delete a playlist and its associated tracks

[0137] 5. Add a track to a playlist

[0138] 6. Reorder playlists (accomplished by dragging and dropping the playlists in the GUI window frame)

[0139] 7. Delete a track from a playlist (highlight the track, activate the "delete" button)

[0140] 8. Reorder tracks in a playlist (this is accomplished by dragging and dropping the tracks in the playlist editor).

[0141] The interaction between audio device content editor **24** and the other elements of the system will be discussed later.

[0142] The function of Internet clock content editor **40** is to manage content **10** that is associated with a scheduled routine, such as a wakeup routine. Internet clock content editor **40** allows the user to associate content **10** such as audio or video files (stored on the user's hard disk drive **30** or streamed over Internet **8**) with an associated time and date. A set of content selections for the one-week period shown on Internet clock content editor in **FIG. 8** is called a wake-up routine. For example, referring now to **FIG. 9**, the user can associate a pointer to a news stream from the Internet **8**, shown as "MSNBC" in the figure, to be triggered at 8 am on Monday through Friday. This association is created by dragging and dropping **28** content object **20** from content selection web page **22**, to Internet clock content editor **40**. At the prescribed time, the scheduler function in core module **42** initiates the serving of content designated by content object **20**, to Internet clock **82**, where it is played or presented to the user to wake them up, or for other purposes where automatic triggering is required.

[0143] The Internet clock content editor **40** capability includes, but is not limited to the following functionality:

[0144] 1. Display calendar (time, days, weeks, months, dates, and the like)

[0145] 2. Select and associate content with a time and date

[0146] 3. Add additional content to a pre-existing routine

[0147] 4. Delete a content object from a routine

[0148] 5. Play audio files from an audio playlist (a playlist made using the audio device content editor)

[0149] 6. Schedule the display of graphics files, such as a series of digital pictures on Internet clock **82** when it is not executing a scheduled wake-up routine.

[0150] 7. Associate a content type or content module with one of the softkey buttons **124** located beside display **132**.

[0151] 8. Synchronize with a user's personal (digital) information manager (PIM), such as a Palm Pilot made by Palm, Inc. of Santa Clara, Calif., or the Cassiopeia, made by Casio Inc., of N.J.

[0152] Both audio device content editor **24** and Internet clock content editor **40** are launched manually by the user by clicking on the associated client device control bar **26** on console **16**. **FIG. 3** shows PC desktop **12** with console **16** showing three client device control bars **26** (the PC's speakers here are not considered a client device although audio can be channeled to them). For example, considering **FIG. 3** as the initial state of launched and running system control application **18**, using the mouse the user would position the pointer on PC desktop **12** on client device control bar **26** that is associated with audio playback device **86** and activate the left mouse button. Audio device content editor **24** launchs and the result is shown in **FIG. 4**, with audio device content editor **24** displayed on PC desktop **12**.

[0153] PC desktop **12** in **FIG. 4** also shows content selection web page **22**. Content selection web page **22** can be launched in a number of ways. One method for launching content selection web page **22** is to activate the Content Guide button **30** located on the bottom of console **16** by using the mouse to place the pointer on top of Content Guide button **30**, and pressing and releasing the left mouse button. Another launching method is to have content selection web page **22**"bookmarked" (Netscapte Navigator) in a browser, or added to a "favorites" list in a browser (Microsoft Internet Explorer). This type of Internet **8** browsing shortcut to a specific web page is well known in the computer industry.

[0154] The spherical icons on content selection web page **22** are content objects **20** that are dragged and dropped onto the audio device content editor **24** tracks window **34**. Using the mouse to control the pointer on PC desktop **12**, the user moves the pointer on top of content object **20**, depresses the left mouse button, and moves the pointer-content object **20** bundle to tracks window **34** of audio device content editor **24** (while continuing to depress the left mouse button). When the user releases the left mouse button, a text description of content object **20** appears in tracks window **34** of audio device content editor **24**. **FIG. 5** shows that content object **20**"Top 40 Radio" has been dragged from content selection web page **22** to audio device content editor **24** tracks window **34**, with drag and drop path **28** depicted. The user would perform this drag and drop operation on content objects **20** for which playback at audio playback device **86** is desired. For example, the "Top 40 Radio" content object **20** represents the URL of an Internet **8** radio stream. As shown in **FIG. 6**, the user can also add audio files to the playlists using a conventional Windows dialog box that allows the user to navigate to a specific subdirectory on PC **34**. This type of PC **34** file access is a well known function

of PCs **34**. Audio device content editor **24** also provides the capability for the user to create playlists. This is accomplished by using the New List button **37**, shown as part of audio device content editor **24** in **FIG. 4** through **FIG. 7**. **FIG. 7** shows that a playlist creation text entry box **36** is launched when the user activates New List button **37**.

[0155] On the software action level, when a user creates or modifies a playlist by adding tracks such as described above using audio device content editor **24**, GUI module **46** modifies system control application database **96**, a file that contains the text names of playlists, the file names and paths of local content files, and URLs of streams, that the user has selected as tracks. A copy of system control application database **96** is stored on both the PC's hard disk drive and on the storage gateway's hard disk drive. In the preferred embodiment, a portion of the files that are set up by the user as tracks in playlists that are accessed at audio playback device **86** are stored on storage gateway **38**. In this scenario, the user can still access tracks stored on storage gateway **38** at audio playback device **86** if PC **34** has been shutdown. The system may also function with the some or all of the files that constitute the tracks listed in audio device content editor **24** stored on the PC **34**. It is obvious that PC **34** must be booted and functioning for the user to access any files stored on PC **34**. The action of accessing those files at audio playback device **86** is discussed below.

[0156] **FIG. 8** shows an initial state for using the Internet clock content editor **40**. Internet clock content editor **40** is formatted as a calendar (with a time domain format), since Internet clock **82** will have varying content depending on the time of day or night. Internet clock content editor **40** is also launched from console **16** in the same way that audio device content editor **24** is launched. **FIG. 9** shows Internet clock content editor **40** after content object **20** has been dragged onto the editor window in the "Monday" slot. **FIG. 10** shows that the user has dragged content object **20**, expanding it across the weekly calendar slots, stopping on the "Friday" slot. Once content object **20** is dragged and placed onto Internet clock content editor **40**, content object **20** is referred to as an expandable content bar **48**. Expandable content bars **48** are dragged across the day sections of Internet clock content editor **40** by using the mouse to position the pointer on the right side of expandable content bars **48**, depressing the left mouse button, dragging across Internet clock content editor **40** (expandable content bar **48** will graphically elongate) while keeping the mouse button depressed. The mouse button can be released when expandable content bar **48** is dragged to the last day on which content **10** referred to by expandable content bar **48** is to be played. Again referring to **FIG. 10**, the result of this programming activity is that every day of the week between Monday and Friday, core module **42** will automatically send prescribed content **10** to Internet clock **82** at the time indicated on left hand side of Internet clock content editor **40**, or at the time that the user has set as the wake-up time at Internet clock **82**. Settings at Internet clock **82** take precedence over Internet clock content editor **40** settings.

[0157] In setup mode, GUI module **46** receives commands from the user via the GUI that is drawn on PC desktop **12**. The user's actions and decisions are recorded by device content editors such as Internet clock content editor **40** and audio device content editor **24** which comprise GUI module **46**, are encoded as digitally described messages, and are then communicated to and stored in system control application database **96** by core module **42**. In the preferred embodiment, where core module **42** exists as a JAVA software program on storage gateway **38**, content **10**, the playlists, and names of tracks and stream addresses, are stored on hard disk drive **30** at storage gateway **38**. PC **34** also contains a copy of system control application database **96**.

[0158] Preferred Embodiment—Real-time Mode

[0159] In real-time mode, the user can activate and control the delivery of content **10** that has been set-up in audio device content editor **24**, either at audio playback device **86**, or at PC **34**. In the preferred embodiment where audio playback device **86** is connected to stereo receiver **114**, the user can access the playlist information on an interface at audio playback device **86**. **FIG. 12** shows that remote control **90** is used to access the source, playlist, and track (content object **20**) at audio playback device **86**. Display **170** included on audio playback device **86** displays text information according to the manipulations of the controls by the user. For example, when the user presses forward playlist button **176** on remote control **90**, an IR stream is transmitted from remote control **90** and is received by IR subsystem **104** on audio playback device **86**. This message is decoded by microprocessor **208** in audio playback device **86** as a forward select button selection, and an XML message **74** is sent from audio playback device **86** to core module **42** requesting that a string of text that represents the next playlist title be sent via high-speed LAN **70** to audio playback device **86**. Core module **42** receives XML message **74** and sends the text string representing the next playlist to audio playback device **86**, via high-speed LAN **70**. Microprocessor **208** processes this XML message **74** and displays the text string on audio playback device **86** display **170**.

[0160] When play button **192** is pressed, again IR subsystem **104** triggers XML formatted message **74** to be sent to core module **42** stating that play button **192** was activated. Core module **42** determines the present file or stream listing on audio playback device **86** display **170**, and initiates a stream of that file or Internet **8** stream to audio playback device **86**.

[0161] The other method for controlling client devices is to use a device controller GUI on PC **34**. Device controllers are launched from console **16** by right clicking on client device control bar **26** on console **16** associated with the specific device that is to be controlled. **FIG. 15** shows the audio playback device controller **60** and **FIG. 16** shows the Internet clock device controller **88**. The function of a device controller is to remotely control networked client devices **78**, and to also allow for the setting of certain preferences and features for client devices **78**. Thus continuing with our previously mentioned examples, audio playback device controller **60** is used to directly control audio playback device **86**, such as to instruct audio playback device **86** to play, stop or pause on a particular track. Similarly Internet Clock controller **88** is used to directly control Internet Clock **82** such as to turn Internet clock on or off, or set the date or time, as shown in **FIG. 16**.

[0162] The following is a list of controls and features for audio playback device controller **60**: a play/pause button **80** (holding down play button causes the player to fast forward, playing brief samples of the audio file at muted volume); a

stop button **76**; a track backward button **72**; a track forward button **84**; a balance slider **94**.

[0163] The following is a list of controls for features on Internet clock controller **88**: ramp display back light during wakeup routine (slowly increase the light of the display during the wakeup routine); ramp audio volume during wakeup routine (slowly increase the volume of the device during the wakeup routine; length of dwell time for snooze button (the length of time that Internet clock **82** is dormant after snooze button **120** is activated; deactivate snooze button **120** (no snoozing); length of time for sleep mode (the length of time Internet clock **82** will play content **10** when activated at night while the user is falling asleep). The function controls now shown in **FIG. 16** are available on an additional menu accessed by activating "more" button **112**.

[0164] Preferred Embodiment—Automatic Mode, Playback

[0165] In automatic mode, content **10** that the user has selected for playback in the content editor is sent automatically to the playback device, based on some prescribed time setting that was pre-set by the user. A scheduling function in core module **42** compares time inputs listed in system control application database **96** with the current state of PC **34** system timer. When a match occurs between a time input in system control application database **96** and the current state of PC **34** system timer, core module **42** initiates the delivery of content **10** to client device **78**. In the case where content **10** is a stream from a URL on Internet **8**, a connection is created by core module **42** between the streaming URL via broadband communication link **14**, through storage gateway **38**, and via LAN **70** to client device **78**.

[0166] Preferred Embodiment—Automatic Mode, Caching

[0167] Certain content objects **20** designate a location for file-based content **10** that changes on a regular basis. In this case, a specific file is a content object **20** instance that is cached on local PC **34** or storage gateway **38** and streamed to client device **78**. For example, content **10** for Internet clock **82** may include a digital audio file with news located on a server on Internet **8** that may be updated every four hours. If content object **20** instance is a file designation that is not local, the scheduling function in core module **42** will periodically check the file at its location on Internet **8** to see if the file has changed. It will do this by comparing the locally cached file's creation date and title, and other file information, with the file located on Internet **8**. If the file's creation date and/or title has changed, the new file will be downloaded and stored on PC **34** or storage gateway **38**, so that the latest file can be sent to client device **78** at the prescribed time. This is part of the scheduling function listed in core module **42** functions in **FIG. 2**.

[0168] Storage gateway **38** is an "always-on" device. Therefore the scheduling function running on core module **42** on storage gateway **38** can be set to automatically access and acquire content **10** on Internet **8** at times when wide area network bandwidth is less expensive, such as overnight or during midday. Core module **42** on storage gateway **38** call also limit data-rates at certain times to further optimize wide area network bandwidth usage. For example, core module **42** can be limited to download data-rate speeds of 200 Kbps during the hours of 4 pm to 10 pm, and allowed to download at the maximum broadband rate any other time. This download optimization setting can be set by users, who may want access to bandwidth while they are home in the evening, or it may be set by network operators. These data-rate control settings and times may be set using a network bandwidth optimization control GUI, accessible by user at PC **34** or by network operators remotely. The data-rate control settings and times are stored in system control application database **96**.

[0169] Preferred Embodiment—System-wide Functions—Tag Interactivity

[0170] Because LAN **70** technology is a two-way interconnection technology, responses from client devices **78** can be sent back through the system and processed and presented to the user and other interested entities at both PC **34** and on the web. **FIG. 12** shows tag button **188** on audio playback device **86**. **FIG. 13** shows tag button **128** on Internet clock **82**. During the playing of content **10**, activation of tag button **128** by the user results in a transmission of XML message **74** back through LAN **70** informing core module **42** that the tag button **128** was activated. Core module **42** then compiles and transmits tag XML message **74** to tag storage and processing server **138**. This process is described in **FIG. 21**. The information in core module **42** tag XML message **74** may include but is not limited to: metadata or meta-tags included in the file or stream (characters or images); the file name if content **10** is a file; the URL or IP address of the stream if content **10** is a stream; time; date; and user identifier.

[0171] The transmission of tag XML message **74** can have different results. **FIG. 14** shows that the information in the message formatted as a readable text message and presented to a user on a personal tag aggregation web page **56**. In this scenario, the user has signed up with an account and receives a password for entry into protected tag aggregation web page **56**.

[0172] The tagging function requires that core module **42** always have access to accurate time and date information. **FIG. 2** shows that core module **42** has a function that accesses a server on Internet **8** where accurate time and date data is available, and these quantities are stored locally by core module **42** in system control application database **96** and is updated relative to the internal time and date timer located internal to PC **34** or storage gateway **38** that stores and runs core module **42** aspect of system control application **18**.

[0173] Alternative Embodiments

[0174] An alternative embodiment of this system includes the TV as an output device for using GUI module **46** aspect of system control application **18**. In this embodiment, system control application **18** resides on a set-top box that includes the components and functionality of storage gateway **38**. Set-top boxes are available that include a DOCSIS cable modem as well as a CATV tuner, hard disk drive **30**, and microprocessor **280**. In this system, the TV can be used as the output device on which the device control GUIs are visually presented, and a set top box remote control with a cursor pointing function is the input device. The GUI images look and function virtually identically to those shown in **FIG. 3** through **FIG. 11**. Most set-top boxes already contain the circuitry and firmware to draw images on a TV screen

(NTSC format), so GUI module **46** would be minimally modified to support the number of pixels on conventional TV screens.

[0175] Alternative Embodiment—Storage Gateway Peripheral

[0176] A storage gateway peripheral **134** is defined as a computer with a integral hard disk drive **30** and processing capability, and an integral wireless LAN transceiver **58** to provide LAN **70** connectivity, that is added to an existing gateway **150** device for the purpose of adding content **10** mass storage and serving capability. **FIG. 23** shows a network topology including PC **34**, a conventional gateway **150** that is a DOCSIS cable modem. Storage gateway peripheral **134** is connected to gateway **150** via a wired LAN connection, in this case Ethernet, that is included in all gateways **150**. Storage gateway peripheral **134** is always-on, and includes power management features such as the ability to power down hard disk drive **30**. Core module **42** is stored and runs on storage gateway peripheral **134**, thus all of the services and functions provided by a system using a storage gateway **38** are provided with the use of a storage gateway peripheral **134**.

[0177] Alternative Embodiment—GUI Content Editors on Storage Gateway or Gateway Storage Peripheral

[0178] The content editors can be programmed and executed across the network as Java applications stored on storage gateways **38** or on a storage gateway peripheral **134** device. The advantage of this is that any computer with a display and input peripherals such as a keyboard and a mouse, and that has a Java Virtual Machine (JVM), would be a viable client device content programming, set-up, and control workstation. This embodiment could also be implemented so that it was entirely browser-based. A user could access the device content editors within a browser window, with the application running as a Java applet.

[0179] Alternative Embodiment—Digital Image Player and Sequence Editor

[0180] Another device that can exist as a client device in this platform is digital picture frame **100**. One implementation of digital picture frame functionality is to set up Internet clock **82** to present a timed sequence of digital images on LCD **132** when Internet clock **82** is not being used for presentation of other content **10**. Internet clock **82** can be set up to present digital images either automatically or under direct control of the user.

[0181] The user could attach a digital image to one of the softkey buttons located on Internet clock **82**. A separate GUI, the digital image editor **96** would be accessed via the left-mouse-click on Internet clock **82** client device control bar **26** located on console **16**. Launching this editor is similar to launching audio device content editor **24**, described previously. **FIG. 18** shows an example of digital image editor **96**. There is a frame into which the user can drag-and-drop image files, or the user can navigate to image files via a conventional dialog box, and add these image files to the frame. The frame would then show a small image of the actual file. The user can drag-and-drop these images to reorder them.

[0182] Alternatively, dedicated digital picture frame **100** can be used to display digital images. Referring again to **FIG. 18**, digital image editor **96** is a GUI that is used to create a digital image playlist for such a device. Digital image editor **96** is launched by left-clicking on the "digital image player" client device control bar **26** on console **16**.

[0183] Alternative Embodiment—Digital Video Caching

[0184] The system for providing content distribution, management, and interactivity for thin client devices can also be used to access, store, and serve digital video, such as movies, TV shows, and other video content. User's make selections on a web site as disclosed herein. Digital video files, such as DVD movies are then downloaded and stored on user's PC **34**, storage gateway **38**, or storage gateway peripheral **134**. The digital video files would then be sent to a client device **78** that is a TV, or any other client device that can decode and present digital video. For example, a PDA with a wireless LAN **70** capability and the ability to decode MPEG-2 video would be a viable terminal client device **78**. The advantage of this system, as opposed to streaming digital video directly from a cable headend or DSL ISP is that is makes better use of network bandwidth. Digital video files are very large, potentially several giga-bytes (billions of bytes). The downloading of these large files can be spread out over a longer period of time than would be required if the digital video files are streamed and viewed in real-time. The digital video files can always be downloading during periods of inactivity on wide area broadband communications connection **14**. Additionally, the download data-rates can be controlled based on the time of day. For example, core module **42** includes a data-rate control function described in this disclosure. The allowable data-rate can be reduced for peak times of wide area network usage, and can be increased during off-peak times.

[0185] Alternative Embodiment—Automated PC-only

[0186] The system for providing content and other information services to thin client devices can be implemented with just PC **34**. System control application **18** resides on hard disk drive **30** on PC **34** and provides all of the functions and features including those provided by core module **42** and GUI module **46**. System control application database **96** also resides on PC **34**, as well as all cached content **10**. In this embodiment, LAN **70** is established by the use of a HomeRF wireless LAN access point **54**. The wireless LAN access point **54** is a self-contained device that communicates with PC **34** via the USB port. Wireless LAN access point **54** includes an RF network interface transceiver **58**, and a microprocessor **116** and firmware for managing the transfer of data between host PC **34**, and an antenna **112**. There is also an antenna integrated into a plastic housing. Wireless LAN access point **54** gets its power from the USB connection. In this embodiment, the wireless LAN access point **54** could also be incorporated into an internal add-on bus card, such as a card that would attach to the PCI bus. Such peripheral bus cards are well known in the field of PC design. In the case of a bus card, there would be an external antenna.

[0187] The automated services function of core module **42**, whereby content **10** is automatically accessed, downloaded and cached on PC **34**, and whereby content **10** is automatically streamed to client devices **78**, is facilitated if PC **34** is always on, or if PC **34** can be automatically turned on (booted). PC **34** includes a Basic Input Output System (hereafter BIOS) for controlling the basic functions of the

system. The BIOS may also be used to automate the booting of PC **34**. In the implementation whereby PC **34** boots automatically, system control application **18** includes software that can modify the BIOS software of PC **34** so that automatic pre-scheduled activation of PC **34** is enabled. Subsequent control of PC **34** to connect to the Internet **10** and perform operations, is also provided by the scheduling function in core module **42**. The BIOS consists of a set of instructions and data that the microprocessor uses as part of its initial sequence of operation. These instructions are stored in a BIOS flash memory chip, which is a nonvolatile type of memory chip, so that the instructions and data are retained when power to the computer is turned off. BIOS software and design, as well as reprogrammable flash memory technology, is well known in the PC industry and will not be described in detail here. The date and time that the computer uses for various purposes is a function that is controlled by the BIOS chip and interface. Typically, a PC motherboard includes a timer and date function that is backed up by a battery on the motherboard. The purpose of this system is so that when the computer is turned on, the operating system has access to accurate time and date information. Since the time and date (timer) function is always operating on a computer motherboard, and this system is connected to the BIOS, most BIOS systems include an automated wakeup function. This is a function that operates internal to the BIOS chip and can be activated or de-activated. If the automatic wake-up function is turned on and a specific time and date is entered and stored in the BIOS memory, a software function operating in the BIOS continually compares the current date and time with a designated wake-up time and function that is stored in memory. When the two times and dates match, a power-on command is given and PC **34** power-up sequence begins. The BIOS modification software automatically modifies the BIOS from the OS level, so that the user doesn't have to access the BIOS during the early phase of PC **34** boot.

[0188] Another function that is performed by the BIOS modification software is to modify the internal settings of PC **34** that control the power saving modes and control parameters which include parameters such as when the PC display is turned off, and when drives are spun down while PC **34** is operating. The BIOS modification software allows for the "always-on" operation of PC **34**. In this case, the PC can be put into a low-power mode with monitor off and with the drive not spinning. Control of various power saving modes is also provided for users at the operating system level. The Advanced Configuration and Power Interface, created by Intel of Santa Clara, Calif. is a set of functions that provide control of PC **34** power usage, allowing the computer to be put into various suspend states, as well as spinning down drives and other functions. Power control functions in core module **42** modify ACPI settings, providing for quiet, low power operation of PC **34**.

[0189] The function of this embodiment will now be described. PC **34** exists in the user's home, or other location where there is a desire for the ability to play Internet **8** content or data **10**, including multimedia content, on one or more standalone devices apart from PC **34**. There is a setup activity for the system, requiring several one-time actions by the user. Then there is an actual use scenario. Referring now to **FIG. 5**, first, the setup activity will be described.

[0190] PC **34** is booted (started up) and a connection to Internet **8** is made. This is achieved by using the dial-up networking function that is standard on any machine with the Windows operating system. This connection could also be an always-on DSL, ISDN, or cable modem connection. Once a connection is made to Internet **8**, browser software is started and the user would navigate to a specific information appliance setup website associated with the system and the devices. This website would have a particular URL that would be supplied in the instruction materials that come with wireless LAN access point **54** or client device **78**. Using the browser, or other interface to the website server, the user would navigate to a setup page at the website that asks for a serial number of client device **78** that the user is planning to use. The user would then connect the USB cable on wireless LAN access point **54** to the USB port on PC **34**. The user would then enter this serial number, which is included in the documentation that is included with the end-user device. The online application has a database of these serial numbers that are associated with each individual manufactured client device **78** (including both wireless LAN access point **54** and client device **78**) that are distributed into the market. Once a match is made between the serial number that the user entered at the website, and a serial number that is included in the online database, an online application automatically begins downloading and installing system control application **18** to user's PC **34**. This software is installed on user's PC **34** and provides the following functions.

[0191] A scheduling function determines when PC **34** automatically connects to the Internet. If PC **34** is running in a power saving mode, such as with the display turned off and with the drives not spinning, the scheduling function will initially act to take the PC **34** out of power saving mode, and then to automatically connect to the Internet using the Dialup Action. Many users will already have PC **34** set up to dial up to an Internet service provider (ISP). In this case, the dialup networking function that already exists will be used. If the user does not have this installed on PC **34**, an application is included that will install the correct dialup information, so that a connection is made to the correct ISP and server.

[0192] At 12 am, PC **34** automatically boots and dials up the ISP. An Internet **8** connection is established. PC **34** automatically connects to the web server associated with client device **78**. Here the user's account is referenced as well as the identifying serial number of user's client device **78**. A volume of content **10** that the user specified to be automatically delivered to Internet clock **82** is downloaded to user's PC **34**, where it is stored on the PC **34** hard disk drive **30**. After the content has completely downloaded, PC **34** terminates the connection to the ISP, and shuts down. This occurs at 1:30 am. At this point PC **34** may also be kept on, as selected by the user during the configuration of the system.

[0193] At 5:30 am, the PC again automatically boots. The wireless communication system establishes a connection to Internet clock **82**. At 6:00 am, the specified wake up time of the user, PC **34** initiates the transfer of content to Internet clock **82**. This content is presented to the user as sound and images, waking up the user.

[0194] Alternative Embodiment—Web-based System Control Application

[0195] In an alternative embodiment there is a website that is accessed for the purpose of downloading and setting up the system control application **18** on PC **34**, and for controlling the content that is sent to client devices **78**, and for controlling the features of client devices **78**. This website is accessible from any computer that is connected to the Internet **8** and includes a browser. The website also contains a database for storing the content preferences of the user or owner of client devices **78**. These content preferences include pointers to the locations of the content entities, such as audio files, video files, or text files, on Internet **8** that the user had specified to be played on client device **78**. The website could also include a server-based version of system control application **18** that would retrieve and store content and data according to user preferences on the web.

[0196] Alternative Embodiment—Webpad Client Device

[0197] In this embodiment, client device **78** is a portable computing device referred to as a webpad **92**, able to be carried around the house or within range of LAN **70**. Webpad **92** includes a set of rechargeable batteries and a battery recharging system. There is also a dock into which the webpad **92** is placed during times when it is not used. When it is docked, there are electrical contacts in the dock that make contact with the electrical contacts on webpad **92** and the batteries are recharged. Webpad **92** also has stored in its non-volatile memory an identifying serial number, which is used to identify webpad **92** on the wireless network, and is also used to coordinate the content that is specified by the user to be sent to and cached at the local PC **34**, and ultimately sent wirelessly to webpad **92**. For example, users can access cached content on PC **34** or storage gateway **38** such as digital, searchable Yellow Pages or White Pages, and other reference databases. Additionally, webpad **92** can access the Internet **8** via PC **34** or storage gateway **38**, utilizing PC **34** or storage gateway **38** as a router.

[0198] Furthermore, webpad **92** can be used to control other client devices **78**. For example, a webpad **92** version of audio device content editor and audio device controller GUI allow the user to access playlists and tracks, and control audio playback device **86** in real time while away from PC **34**. XML messages **74** are sent from webpad **92** to PC **34** or storage gateway **38**, processed by core module **42**, and appropriate XML messages are sent to audio playback device **86**.

[0199] Alternative Embodiments

[0200] LAN **70** could be implemented with a number of different of wireless systems such as 802.11b, 802.11a, or Bluetooth. The wireless communication system could be a 900 Mhz system used on many cordless phones. The system could be implemented with a phone line network system where the house wiring is used as the network physical layer for communication between PC **34** and client devices **78**. The system could be implemented using an AC power line networking technology that uses the AC wiring in the home as the network physical layer. It should be noted also, that the system will work with any type of connection to the internet, including other broadband technologies such as DSL or fixed wireless, or a dialup modem connection.

[0201] A phone that includes a microprocessor, memory, and network interface is also a client device. The content **10** that would be transferred to it would be the digital address books, such as those that are a part of PDA databases and desktop organizer software, such as Palm Desktop or Microsoft Outlook. The phone numbers from these personal information managers, and other relevant phone numbers could be downloaded from the web and cached at the PC, and subsequently transferred to the phone database, so that dialing can be made much easier.

I claim:

1. A system for channeling content to computer devices, comprising in combination,

a connection to the Internet,

a local server with a mass storage device,

a web site for providing access to content selections,

a means for associating a content selection for streaming with a client device,

a local area network connecting the local server to a client device, and

a client device for receiving and decoding content selections.

2. The system of claim 1 where the client device is a digital audio decoder.

3. The system of claim 1 where the means for associating a content selection for streaming with a client device is a drag and droppable content object.

4. The system of claim 1 where the mass storage device is a personal computer.

5. The system of claim 1 where the mass storage device is a storage gateway.

6. The system of claim 1 where the mass storage device is a storage gateway peripheral.

7. The system of claim 1 where the local area network is a wireless network.

8. The system of claim 1 where the client device is a webpad.

9. A method for delivering digital content from to client computer devices including:

a. Associating a content selection with a client device.

b. Activating the streaming of the content selection to the client device, via a local storage device.

10. The method of claim 9 where the association between a content selection and a client device is a drag and drop interface between and web page and a content editor on a PC.

11. The method of claim 9 where the client device is a digital audio decoder.

12. The method of claim 9 where the activation of the streaming of the content selection is performed at the client device.

13. The method of claim 9 where the local storage device is a storage gateway.

14. The method of claim 9 where the local storage device is a storage gateway peripheral.

15. A system for channeling content to client devices, comprising in combination,

a local computing and mass storage device comprising a hard disk drive, a

microprocessor, and a local area network connection,

a broadband connection for connecting the local computing device to the Internet,

Content objects located on a web page on the Internet,

a means for associating content objects located on the Internet with content object editors on the local computing device whereby content represented by content objects is downloaded and stored on the local computing device, and,

a means for streaming content stored on the local computing device to client devices.

16. The system of claim 15 where the local computing device is a storage gateway.

17. The system of claim 15 where the local computing device is a storage gateway peripheral.

18. The system of claim 15 where the means for associating content objects on the Internet with content object editors on the local computing device is a drag and drop interface.

19. The system of claim 15 where the client device is a audio playback device.

20. The system of claim 15 where the client device is a webpad.

* * * * *

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CLOUD, JOIYA M	
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RECD MAY 05 2008

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

SEP 2 9 2008
PATENT & TRADEMARK OFFICE

Office Action Summary	Application No.	Applicant(s)	
	10/763,868	EYTCHISON ET AL.	
	Examiner	Art Unit	
	Joiya M. Cloud	2144	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

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DETAILED ACTION

1. This action is responsive to communication filed 01/14/2008. Claims 1-26 are pending. Applicant's arguments filed 01/14/2008 have been fully considered but they are not persuasive.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Armstrong et al. (US Publication No 2002/0073172 A1, hereinafter Armstrong) in view of Janik et al. (U.S. Publication No. 2002/0013852 A1, hereinafter Janik).

As per claim 1, Armstrong discloses the invention substantially as claimed. **Armstrong** teaches a method comprising: storing an initial portion of the content item in a temporary storage cache **(Abstract, paragraphs [0018], [0030], [0033])**; receiving a request for the content item **(Abstract, paragraphs [0018], [0030], [0033])**; streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request **(Abstract, paragraphs [0018], [0030], [0033])**; producing a resultant stream **(where the resultant stream is the remaining portion)** using the initial portion of the content item; and seamlessly

transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item **(paragraphs, [0033], [0046], and [0037])**.

Although the Background of Armstrong specifically states that a "user ideally selects desired content" in paragraph [0006], Armstrong does not explicitly identifying a preference and selecting a content item based on the preference;

However, Janik teaches identifying a preference **(paragraphs [0080] and [0082])**; selecting a content item based on the preference **(paragraphs [0080] and [0082])**;

Accordingly, it would have been obvious to one of ordinary skill in the networking art at the time the invention was made to have incorporate Armstrongs's teachings to the teachings of Janik, for the purpose of providing a means to allow the user to receive specific requests based on their preference and furthermore for returning to a user a desired stream to "meet user expectations" **(Armstrong: paragraph [0006])**.

As per claim 2, Armstrong-Janik teaches a method wherein the preference is associated with a user **(Janik: paragraphs [0080] and [0082])**.

As per claim 3, Armstrong-Janik teaches a method wherein the preference includes a playlist **(Armstrong: paragraph [0044])**.

As per claim 4, Armstrong-Janik teaches a method wherein the resultant stream mirrors the entire segment of the content **(Armstrong: paragraph [0031)**.

As per claim 5 Armstrong-Janik teaches a method further comprising identifying a user associated with the preference **(Janik: paragraphs [0080] and [0082])**.

As per claim 6, Armstrong-Janik teaches a method wherein the content includes one of a document, an image, audio data, and video data **(Armstrong: paragraph [0018], lines 1-5 and Janik: paragraph [0009])**.

As per claim 7, Armstrong-Janik teaches a method further comprising transmitting the entire segment of the content to a stream buffer in response to the request **(Armstrong: paragraph [0040])**.

As per claim 8, Armstrong-Janik teaches a method wherein the transmitting the entire segment of the content occurs simultaneously with streaming the initial portion **(Armstrong: paragraphs [0031], [0032], and [0040])**.

As per claim 9, Armstrong-Janik teaches a method wherein the seamlessly transitioning occurs in real-time **(Armstrong: paragraph [0027], [0031], [0032])**.

As per claim 10, Armstrong-Janik teaches a method according to claim 1, further comprising presenting the resultant stream beginning with the initial portion and subsequently followed by a portion of the entire segment **(Armstrong: paragraph [0046], lines 7-12)**.

As per claim 11, Armstrong-Janik teaches a system comprising means for identifying a preference **(Janik: paragraphs [0080] and [0082])**; means for selecting a content item based on the preference **(Janik: paragraphs [0080] and [0082])**; means for storing an initial portion of the content item in a temporary storage cache **(Armstrong: paragraphs [0018], [0030], [0033])**; means for receiving a request for the content item; means for streaming the initial portion of the content item from the temporary storage cache to a stream synchronizer in response to the request **(Armstrong: paragraphs [0018], [0030], [0033] [0037])**; means for producing a

resultant stream using the initial portion of the content item; and means for seamlessly transitioning the resultant stream from the initial portion of the content item to an entire segment of the content item **(paragraph [0037])**.

As per claim 12, claim 12 is substantially the same as claim 1 and thus rejected using similar rationale. Furthermore, regarding simultaneously loading an entire segment of the selected content item to the stream synchronizer while streaming the initial portion **(paragraph [0031] and [0032])**

As per claims 13-17, the rejection for claims 1, 6, and 9 applies fully.

As per claim 18, Armstrong-Janik teaches a method further comprising displaying the resultant stream **(Armstrong: paragraph [0023])**.

As per claim 19, claim 19 is substantially the same as claim 1, but in system form rather than method form. Therefore, the rejection for claim 1 applies equally as well to claim 19.

As per claim 20, Armstrong-Janik teaches a system comprising a media server configured for storing an entire segment of content **(Armstrong: paragraph [0042])**; a client device configured for storing an initial portion of the content wherein the client device is configured to display the content by streaming a resultant stream from the initial portion of the content while simultaneously receiving the entire segment of the content and seamlessly substituting the entire segment of the content for the initial portion **(Armstrong: paragraphs [0044],[0046])**.

As per claim 21, Armstrong-Janik teaches a system wherein the client device is configured to store the initial portion of the content prior to a request for the content **(Armstrong: paragraph [0073])**.

As per claim 22, Armstrong-Janik teaches a system wherein the client device is configured to receive the entire segment subsequent to a request for the content **(Armstrong: paragraph [0046])**.

As per claim 23, system according to claim 20, wherein the client device further comprises a preference data module configured for storing information relating to the content **(Janik:)**.

As per claims 24-26, the rejection for claims 1 and 6-7 applies fully.

Response to Arguments

A) Armstrong does not teach storing an initial portion of the content item in a temporary storage cache. The information server 125 of Armstrong is not a temporary storage cache.

As to the above point A), Examiner respectfully disagrees. Armstrong specifically teaches as stated by the Abstract "storing an initial portion of each title on a primary storage..." Applicant's claim requires "storing an initial portion of the content item in a temporary storage cache," which is clearly taught by Armstrong. The interpretation that the Examiner has relied upon for "temporary storage cache" is defined by the process of storing to the primary storage as

described in Armstrong and not the information server 125. As temporary storage cache serve as staging areas or buffers of the sort, Examiner notes the primary storage media as defined by Armstrong's instant specification is a disk array (paragraph [0040]). A disk array is appropriately defined by Wikipedia is a disk storage system which contains multiple disk drives. It is differentiated from a disk enclosure, in that an array has ***cache memory*** and advanced functionality, like RAID and virtualization. (see http://en.wikipedia.org/wiki/Disk_array). Furthermore, Armstrong specification discloses the storing process to include storing the information to respective buffers which serve as temporary storage cache **(paragraph [0040]).**

B) Armstrong does not teach selecting and storing a content item based on an identified preference.

As to the above point B), Examiner respectfully disagrees. Examiner submits that in response to Applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., selecting and storing a content item based on an identified preference.) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). However, the Applicant's claim *does* recite similar language in claim I stating "identifying a preference; selecting a content item based on the preference," which is rejected as unpatentable over Armstrong in view of Janik. The last Office Action (filed 10/18/2007) specifically states that this limitation is met inexplicitly in Armstrong (i.e. "user ideally selects desired content") and explicitly in Janik where the reference teaches a user provides a content

preference by checking boxes beside content types that they wish to receive which in turn is displayed back to the users.

C) Janik does not teach prefetching content based on a preference corresponding to a user.

As to the above point C), Examiner respectfully disagrees. Examiner submits similar response to arguments as stated for point B. Furthermore, Examiner notes that Janik teaches prefetching a content based on a prefetch parameter and a display window, where the user is able to select a content preference that filters the content based on the preference corresponding to the user's and user selection.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joiya Cloud whose telephone number is 571-270-1146. The examiner can normally be reached Monday to Friday from on 7:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Vaughn can be reached on 571-272-3922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-3922.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JMC

/William C. Vaughn, Jr./

Supervisory Patent Examiner, Art Unit 2144 April 26, 2008